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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences*.

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 138
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 139
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 140
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

92 SOLAR PHYSICS 140
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 140
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

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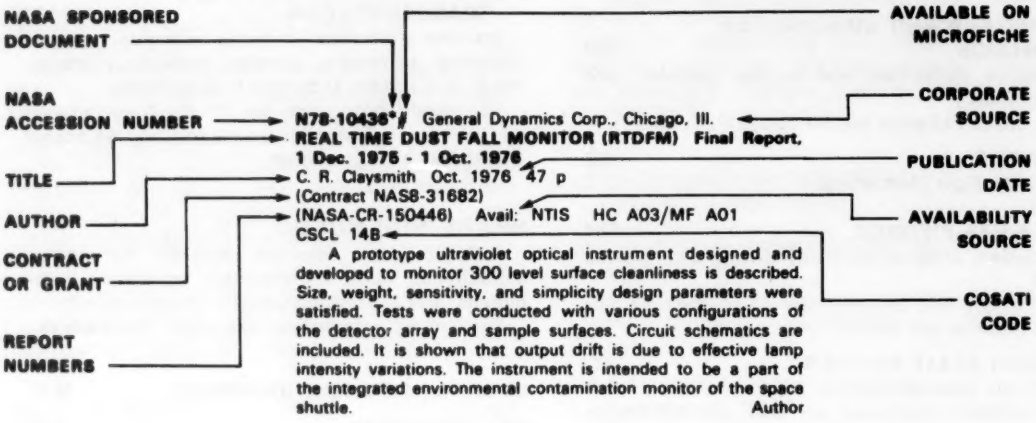
TYPICAL CITATION AND ABSTRACT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N78-10436*# General Dynamics Corp., Chicago, Ill.
CORPORATE SOURCE
REAL TIME DUST FALL MONITOR (RTDFM) Final Report, 1 Dec. 1975 - 1 Oct. 1976
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PUBLICATION DATE
C. R. Claysmith Oct. 1976 47 p
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(NASA-CR-150446) Avail: NTIS HC A03/MF A01
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REPORT NUMBERS
A prototype ultraviolet optical instrument designed and developed to monitor 300 level surface cleanliness is described. Size, weight, sensitivity, and simplicity design parameters were satisfied. Tests were conducted with various configurations of the detector array and sample surfaces. Circuit schematics are included. It is shown that output drift is due to effective lamp intensity variations. The instrument is intended to be a part of the integrated environmental contamination monitor of the space shuttle.
Author

ON-GOING RESEARCH PROJECTS

This is a listing of research projects – not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, MINI-RPV (REMOTELY PILOTED VEHICLE) ENGINE DEMONSTRATOR PROGRAM
M. JOHNSTON, Teledyne Continental Motors, *Mobile, Alabama* 36601 (DA0D4106; DAAJ02-77-C-0015)

Develop a lightweight, twin-cylinder, two-stroke demonstrator engine which provides a technology base for future Army mini-RPV's. Address to and solve existing problems of high weight, vibration levels, fuel consumption and short life.

Design, fabricate, test and deliver for government test five mini-RPV engines designed around currently available high-production engine components, i.e., pistons, cylinders, rods, etc. Make component modifications necessary to achieve the program goals of 1.2 lb/hp, 0.8 lb/hp-hr SFC, 150 hour life, operation to 12,000 ft density altitude.

ADDENDA: Supporting agency address is: AVSCOM Air Mobility R&D Lab, Eustis Directorate, Ft Eustis, VA 23604

SUPPORTED BY U.S. Dept. of Defense, Army

1.0002, THE FEASIBILITY OF OFF-AIRPORT PASSENGER TERMINALS
R. HORONJEFF, Univ. of California, Graduate School, *Berkeley, California* 94720 (OS-60128; OS59564 (TRAIS NO.))

Acquiring and analyzing data on the operation of off-airport terminals for the processing of passengers and their baggage. The purpose of the study is to provide a better understanding of the various aspects of the operation of off-airport terminals and from this understanding to develop a methodology for the analysis of the feasibility of future off-airport terminal facilities.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0003, ENCOUNTER BETWEEN AIRCRAFT - A STUDY OF EVASION
G. LEITMANN, Univ. of California, School of Engineering, *Berkeley, California* 94720 (NSG 2242)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

1.0004, STUDY FOR SMALL AND LARGE AIRCRAFT STRUCTURAL LOADS CRITERIA BASED ON AIRCRAFT AND ATMOSPHERIC DYNAMICS
UNKNOWN, Systems Technology Inc., *Hawthorne, California* 90250 (FA77WA-3936; FA59976 (TRAIS NO.))

Task 1 - Perform an analysis to determine small aircraft structural loading imposed as a function of the aircraft stability, control and handling qualities characteristics to include the effects of human pilot inputs or the intervention of the pilot when an upset or abnormal flight condition occurs. Task 2 - Perform analysis the same as task 1 for large aircraft structural loading.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0005, STUDY TO IMPROVE AIRFRAME TURBINE ENGINE ROTOR BLADE CONTAINMENT
UNKNOWN, McDonnell Douglas Corporation, *Long Beach, California* 90808 (FA59303; FA76WA-3843)

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0006, PRODUCTIVE APPLICATIONS OF AEROELASTICITY
S.M. BATILL, U.S. Air Force, Aeronautics Department, *Colorado Springs, Colorado* 80840 (DF282150)

AF function - technology base. Deficiency - requirements for the most efficient use of energy resources have established a need for research directed toward more efficient means of flight. Objective - a study will be made of low-speed airfoils to determine how applications of aeroelasticity such as time varying camber, thickness, and twist could increase the efficiency of flight. How research contributes - will result in feasible methods of improving endurance, range, fuel economy, etc., through aeroelasticity.

After a thorough literature survey, a numerical study will be performed with emphasis placed on the development of a method for enforcing the flow boundary conditions on thick, nonsteady airfoil sections undergoing cyclic or quasi-cyclic motion. Computer graphics techniques will be used. The objective is to determine optimum aerodynamic cycles for different mission requirements. Long-range plans call for subsonic wind-tunnel tests to verify those concepts which appear most feasible as a result of the numerical study.

ADDENDA: Supporting agency address is: Frank J Seiler Research Lab NH, USAF Academy, Colo 80840

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0007, SONIC BOOM RECORDING AND WEATHER DATA ANALYSIS
UNKNOWN, U.S. Natl. Aero. & Space Adm., *Washington, District of Columbia* 20553 (FA59147; FA76WAI-625)

NOAA shall provide a daily sonic boom recording and weather data analysis at specified locations to monitor and measure sonic boom overpressure signatures generated by any aircraft operating near Concorde arrival and departure routes.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0008, VHF AVIONICS MODIFICATIONS/AIR TRAFFIC CONTROL
UNKNOWN, Bendix Corporation, *Fort Lauderdale, Florida* 33310 (FA59121; FA75WA-3705)

(1) Demonstrate that it will be possible to attain the quality of service expected in an operational phase for air traffic control (ATC) and air carrier purposes; (2) Evaluate the technical and operational performance of voice and data communication between ground and aircraft over various areas; (3) Permit experimental evaluation of dependent and independent surveillance capabilities, and of navigational data derived by an aircraft utiliz-

ing ground and satellite transmissions; (4) Directly compare the performance of VHF and L-band aeronautical satellite systems for voice and data communications and surveillance.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0009, SENSITIVITY OF NOISEMAP CONTOURS TO CHANGES IN AIRCRAFT OPERATIONS
D.K. HOLGER, Iowa State Univ. of Sc. & Tech, School of Engineering, *Ames, Iowa* 50011 (DF048520; AF-AFOSR-3308-77)

AF function - aircraft noise environmental impact. Deficiency -lack of understanding of the changes to the noise environment due to changes in aircraft type and operational procedures. Objective - obtain criteria for determining when a change in aircraft type or operation alters the noise environment sufficiently to require new noise contours for that installation. How work contributes - the Air Force will continue to operate aerospace vehicles from bases in close proximity to the civilian populace. Close cooperation with public and federal officials is necessary to maintain good relations and to comply with environmental standards. This proposal will evaluate the sensitivity of the noise level zones around an airfield to changes in aircraft operations. Better knowledge of these factors will prevent costly and time-consuming complete rerunning of the noisemap contours every time aircraft operation procedures change.

Full-scale noisemap evaluations for seven bases will be run. Multiple runs for each base will be accomplished for various modifications of aircraft operations and types. The sensitivity of the noisemap to these modifications will be observed and criteria sought for determining threshold limits that warrant complete air installation compatibility use zones (AICUZ) restudies.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0010, INTERFACING BETWEEN GROUND COMPUTER AND FLY-BY-WIRE CONTROL SYSTEM
H.E. TALLEY, Univ. of Kansas, School of Engineering, *Lawrence, Kansas* 66044 (NSG 4012)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

1.0011, TESTING A NASA 20-INCH STAGE AND AN AIR FORCE MASS FLOW STAGE
J.L. KERREBROCK, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NAS 3-20473)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

1.0012, ESTIMATING VOLUME OF INTERNATIONAL AIR TRAVEL AND DISTRIBUTION OF INTERNATIONAL AIR TRAVEL ON SPECIFIC ROUTES
UNKNOWN, Simat Helliesen & Eichner Inc., *Newton Center, Massachusetts* 02159 (OS-60516/2; OS59934 (TRAIS NO.))

The objective is to undertake an analysis to explain and predict a carrier's share of passengers on single-plane flights in an international market, giving consideration to the propensity of passengers to fly with their flag carriers. This analysis shall be based on traffic and schedule data for years 1974 and 1975 and where data is available, 1976, and shall take into account the structure of DOTs analytical framework developed to support the U.S.-U.K. bilateral negotiations.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0013, REREPS VALIDATION TESTS
G.C. HOFF, U.S. Army, Waterways Experiment Station, *Vicksburg, Mississippi* 39180 (DA0U8015)

To validate the ability of a regulated-set cement runway crater repair to withstand the necessary aircraft loads within a period of 4 hr after completion of the repair. Included in this validation is the requirement for load transfer between the old and new pavement around the edge of the repair and a quick method for providing for the transfer. Through these tests the requirement for subgrade strength will be determined. The method of screeding a large crater will be examined.

The approach to the validation involves the construction of a 12-in.-thick concrete pad 50 x 200 ft with four 30-ft diameter holes in the center. The holes will be excavated and filled using the technique developed in Germany for repairing a crater. The craters will be capped with regulated-set cement. The repairs will be load tested starting immediately after completion of the repair with a F4C aircraft wheel. After a period of time, the aircraft type will be changed to a C-141. Results of the load test will validate the method presently used for repair in Germany.

ADDENDA: Supporting agency address is: OCE Waterways Experiment Station, PO Box 631 Vicksburg, MS 39180

SUPPORTED BY U.S. Dept. of Defense, Army

1.0014, IMPROVED CRITERIA AND PLASTIC COMPONENTS FOR AIRPORT AIRSIDE DRAINAGE SYSTEMS
UNKNOWN, U.S. Army, Waterways Experiment Station, *Vicksburg, Mississippi* 39180 (FA75WAI-536; FA58382 (TRAIS NO.))

Airport airside drainage systems include all surface and subsurface drainages from paved facilities and adjacent areas to keep pavement subsurface layers from weakening by excess moisture. The effort consists of: (1) an evaluation of improved drainage criteria developed for airports and highways, and recommendations for incorporation of these criteria, if acceptable, into a Federal Aviation Administration Advisory Circular (FAA, AC) and (2) investigation of the availability of specific types and sizes of hydraulic and drainage components made of plastic materials, and determination of engineering and design data for the plastic components applicable to drainage systems in airport runways, taxiways and parking aprons.

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0015, AN EXPERIMENTAL AND ANALYTICAL INVESTIGATION OF THE AERODYNAMICS OF A HYPERSONIC VEHICLE
V. ZAKKAY, New York University, School of Science & Engin., *New York, New York* 10003 (NSG 1444)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

1.0016, INVESTIGATION OF AERODYNAMIC CHARACTERISTIC OF SUBSONIC WINGS
F.R. DEJARNETTE, Univ. of North Carolina, School of Engineering, *Raleigh, North Carolina* 27607 (NSG 1437)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

1.0017, ENGINEERING AND TECHNOLOGY SERVICES FOR INSTRUMENT LANDING SYSTEMS (ILS)
UNKNOWN, Ohio University, Graduate School, *Athens, Ohio* 45701 (FA75WA-3549; FA59796 (TRAIS NO.))

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

1.0018, NAVY VEHICLE DESIGN AND CONSTRUCTION - LIFTING SURFACE THEORY FOR THRUST AUGMENTING EJECTORS
P.M. BEVILAQUA, Rockwell International Corp., *Columbus, Ohio* 43216 (DN775363; N00014-77-C-0271)

The objective of this investigation is to develop a computational technique for thrust augmenting ejector analysis that will include the effects of conditions external to the ejector as well as flow within the ejector shroud. For thrust augmenting ejectors in V/STOL aircraft applications, the influence of the aircraft wing/body, the proximity of the ground in landing and takeoff and the requirement for shorter, more compact diffuser sections all have an influence on augmentor performance. Classical ejector analysis considers only conditions internal to the ejector shroud and therefore cannot satisfactorily predict overall ejector performance when installed in a V/STOL configuration.

The approach taken in this effort is to separate the ejector flow field into two regions: the flow through the ejector and the flow external to the ejector. The internal flow will be calculated using classical momentum theory while lifting surface theory will be used for the external flow and the solutions will be properly matched to give a solution valid for the entire flow field.

ADDENDA: Supporting agency address is: Office of Naval Research, Arlington, VA 22217

SUPPORTED BY U.S. Dept. of Defense, Navy

1.0019, FLYING QUALITIES CRITERIA TO PREVENT PILOT-INDUCED OSCILLATIONS (PIO)

R.H. SMITH, Systems Research Labs. Inc., *Dayton, Ohio* 45432 (DF140110; F33615-77-C-3011)

The objective of this effort is to prepare recommended new requirements for inclusion in MIL-F-8785B, Flying Qualities of Piloted Airplanes. The emphasis is to be on developing new quantitative requirements to preclude pilot-induced oscillations (PIO) along with consistent revisions to the transient force requirements and pitch dynamic requirements. These revisions are necessary because present specification requirements have not prevented potentially serious PIO problems in recently developed military aircraft. Unless these criteria are developed, PIO will continue to be a problem in future military aircraft, especially those that have high authority stability and command augmentation systems with intentional control nonlinearities.

The approach will employ pilot-vehicle analysis methods to arrive at closed-loop criteria that account for the pilot-in-the-loop effects. More specifically, a PIO requirement will be developed on the basis of a frequency domain resonance criterion that has been hypothesized. Additional work will validate the requirement against existing data and related analysis methods. The case of longitudinal PIO will be considered in this effort and review of longitudinal control force and dynamic response requirements will be performed to define revisions that will result in a consistent set of longitudinal requirements.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0020, IMPROVED AEROELASTIC TAILORING AND STRUCTURAL OPTIMIZATION

T.J. HERTZ, U.S. Air Force, Flight Dynamics Lab., *Dayton, Ohio* 45433 (DF140800)

Through the application of aeroelastic tailoring of advanced composite structures, it has been shown feasible to aeroelastically deform the lifting surfaces of advanced fighter aircraft to provide improved performance of these aircraft. Prevention of flutter in thin wings has been achievable analytically while providing minimum drag and maneuver load relief. With the improvements in the wing aeroelastic synthesis procedure (computer program TSO), such as the addition of flexible control surfaces and improved drag calculations, the possibility of increasing the uses of the computer program (TSO) exist. The objective of this work unit would be to continue work on the computer program (TSO) in order to increase its efficiency, improve its optimization scheme, and increase the potential for use on a wider range of aircraft.

The approach to the program would be divided into two parts running concurrently. The first part would concentrate on improving the efficiency of the computer program (TSO) and improving and/or replacing the optimization scheme and other algorithms in order to apply it to a wider range of problems (i.e., nonplanar wings, wings with stores). The second part, begun shortly after the start of the program, would be devoted to the use of the computer program (TSO) on two aircraft configurations. These aircraft configurations would be selected on the basis of most beneficial application of aeroelastic tailoring.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FBRC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0021, SOME TECHNIQUES OF DATA ANALYSIS IN FLIGHT CONTROL AND RELATED PROBLEMS

P.R. KRISHNAIAH, Univ. of Pittsburgh, Graduate School, *Pittsburgh, Pennsylvania* 15213 (DF139930; AF-AFOSR-3239-77)

Part of AFFDL's responsibility is the development of advanced flight control systems and crew stations. In order to compare candidate flight control systems and crew station components, simulations and flight tests are conducted in which pilot performance is measured. However, there is no single measure of pilot performance, thus requiring the collection of many kinds of performance data and their analysis by means of multivariate statistical techniques. The objective of this work effort is to evaluate available multivariate statistical techniques for simultaneous comparison of mean vectors and the development of computer programs to implement these techniques.

Seven currently available techniques will be evaluated by the contractor as to their robustness to violations of the assumptions of homogenity of the population covariance matrix and the normality of the multivariate distribution. The most robust technique will be implemented by means of computer programs which will be available for use by AFFDL personnel.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FBRD, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

1.0022, FUEL CONSERVATION WITH AIR TRANSPORTATION - A PRELIMINARY STUDY

A. GUSTAFSON, Aeronautical Res. Inst., *Bromma, Sweden* (72/76-82)

OBJECTIVE: 1. Survey of national and international suggestions and measures already taken to initiate fuel conservation within the air transport industry. 2. Identify and analyze the most promising means of reducing air transport fuel requirements with special attention to operating procedures with existing equipment. 3. Identify possible and suitable research projects that might follow.

INTENDED USE OF RESULTS: To give information about the possibilities for fuel conservation within air transportation. To form the basis for decision about possible follow-up research and development projects within the area.

SUPPORTED BY Transport Research Delegation

1.0023, FOLDING GEODESIC SHELTERS

O.F. KEZER, U.S. Army, Mobility Eqp. Res. & Dev. Com., *Fort Belvoir, Virginia* 22060 (DA0D3626)

The objective of the program is to evaluate folding geodesic structures as shelters for personnel and equipment.

Approximately six shelters will be procured for evaluation of concept for protection of personnel and equipment. Shelter sizes will range from small general-purpose tents to large maintenance shelters for attack helicopters.

ADDENDA: Supporting agency address is: NARADCOM Natick R&D Command, Attn- DRXNM-USO, Natick, MA 01760

SUPPORTED BY U.S. Dept. of Defense, Army

1.0024, EXTENSION OF FLEXSTAB FOR ANALYSIS, ACCURACY AND EFFICIENCY

J. DORNFELD, Boeing Company, *Seattle, Washington* 98108 (DF138870; F33615-76-C-3170)

Control configured vehicle (CCV) flight control systems (FCS) are being designed to improve the operating efficiency of military aircraft and therefore reduce their operating costs. The benefits of the CCV FCS are to improve the fatigue life, ride qualities, handling qualities and maneuverability of military air-

craft and thus improve mission performance. The objective of this work is to advance level 2.01.00 Flexstab capabilities to design and analyze advanced CCV FCS, and also to provide support to AFFDL, other Air Force offices and private industry. Primary Flexstab R&D efforts under this program are to determine the limit of applicability and perform preliminary analysis to include the following: finite-element structural theory, improved Kusner Wagner and/or doublet lattice unsteady aerodynamics, load equations for the design and analysis of load improvement control systems, experimentally distributed loads, efforts of control surface elasticity. The finalized results shall be documented recommending necessary development and additional in-house and contractual efforts for FY 76 and FY 77.

This work will consist of analytical and experimental studies to determine the best methods to modify Flexstab to produce more accurate and cost-effective prediction methods. The approach is to (1) formulate dynamic load equations based on level 2.01.00 perturbation output, (2) incorporate these equations into the controls-free analysis programs, (3) determine limits of applicability, (4) recommend other in-house and contracted efforts, (5) provide additional support. Reports will be prepared during the course of this effort to document significant accomplishments.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FGC, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, OPTIMAL ATTITUDE CONTROL OF FLEXIBLE SATELLITES

K.T. ALFRIEND, U.S. Navy, Res. Laboratory, *Washington, District of Columbia* 20375 (DN680434)

The objective of this program is the development of methods for the optimal and sub-optimal attitude control of flexible satellites.

The initial step is the implementation of the satellite flexibility into the control problem. This will be accomplished by investigating the various methods for modeling the flexibility to see how they can be included in the control problem. Various classical satellite problems will then be considered to compare methods of minimizing flexible body motion. Finally, general methods will be developed.

ADDENDA: Supporting agency address is: Naval Research Laboratory (7000), Washington, D.C. 20375

SUPPORTED BY U.S. Dept. of Defense, Navy

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, STRATOSPHERIC PHOTOCHEMISTRY

H.S. JOHNSTON, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (CHE75-17833 A02)

The general problem of photochemical reactions in the natural and in possibly perturbed stratosphere, including laboratory investigation of specific chemical reactions, is being studied. Work is being carried out on the photolysis of NO3, on the quantum yield of singlet oxygen from ozone, and on kinetics of the rate of reaction of HOO with hydroxyl radicals and with chlorine atoms. Further theoretical work on chemical reactions in atmosphere is also being undertaken. A.W. Brewer's work on measuring the concentration of tropospheric and stratospheric nitrogen dioxide from the differential absorption spectrum with visible light, using the sun, moon, or stars as light sources, is being extended. Some effort is being made to extend Brewer's method at several different triplets of wavelength and to confirm or modify the method. The objectives of this work are to demonstrate a relatively simple method that could be used for a program of monitoring NO2 and to establish the diurnal cycle of NO2 in the stratosphere.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0002, THEORETICAL STUDY OF CARBON MONOXIDE MOLECULE CHEMISORBED ON IRON AND PLATINUM SURFACES

G.M. POUND, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2251)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

3.0003, HETEROGENEOUS CHEMISTRY - ASSOCIATION REACTIONS, CLUSTER FORMATION, AND SURFACE PHENOMENA

A.W. CASTLEMAN, Univ. of Colorado, School of Arts & Sciences, *Boulder, Colorado* 80302 (NSG 2248)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

3.0004, COMBUSTION RESEARCH

D. EVANS, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (4914679)

PURPOSE: Control at an acceptable level the probability of a sustained ignition in the environment by materials selection in terms of ease of ignition.

OBJECTIVES: Understanding ignition and propagation phenomenainre materials.

FY77 MILESTONES: Develop techniques for studying the adiabatic ignition of plastic forms and related materials (9/77). Determine mechanism of smoldering combustion of charcoal and related materials (9/77). Establish experimental capability to investigate flame reactions (1/77). Investigate role of oxygen in polymer pyrolysis (6/77). Study response of thermally stable and fire-retarded polymers to various energy flux levels (9/77). Investigate mechanism of actions of phosphorus, halogen and other fire retardants in polymer systems (9/77).

ACCOMPLISHMENTS: The oxygen index method was used to study extinction phenomena in liquids. The importance of gas phase processes in flame inhibition by phosphorus was demonstrated. A flat flame burner system for flame research was designed and construction was started. A mass spectrometer was acquired for use with this system. A computer model of flame processes was developed further and applied to simple flames.

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

3.0005, STRUCTURE-PROPERTY-ENVIRONMENTAL RELATIONS IN GLASS AND GLASS-CERAMICS

L.L. HENCH, State University of Fla. Sys., School of Engineering, *Gainesville, Florida* 32611 (DF047230; AF-AFOSR-3210-77)

AF function - advanced aircraft and tactical missile systems employ glass as a structural and optical component which requires superior mechanical, optical and thermal performance under extreme environmental conditions. Deficiency - the methodology for predicting long-term stability and performance of glass and glass-ceramics has not be established. Objective - the objective of this research is to establish predictive structure-property-environmental relations in glass and glass-ceramics. How work contributes - this research is expected to establish the relationships between environmental exposure and use and the nondestructive testing procedures for predicting long-term stability and performance in glass and glass-ceramics.

Glass chemistry will center on (1) alkali silicate, commercial, and other glasses and glass-ceramics, (2) the development of techniques to obtain quantitative analysis of the residual glassy

phase, (3) the effects of the glassy phase on various physical properties and (4) environmental deterioration of the glassy phase and the effect of the deterioration on the physical properties.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NC Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0006, ADSORPTION ON METALS

R. GOMER, Univ. of Chicago, Graduate School, *Chicago, Illinois* 60637 (CHE77-08328)

Measurements of absolute coverages, adsorbate dipole moments, and sticking coefficients of adsorbed gases on single-crystal planes will be extended to oxygen, CO, nitrogen, Xe and others on various planes of tungsten. Sticking coefficients will be measured as functions of coverage and surface and gas temperatures. Surface diffusion studies on single-crystal planes will be continued by measuring the time correlation function of field emission current fluctuations from regions of single planes when adsorbate-covered emitters are heated to temperatures where adsorbate becomes mobile. The two-dimensional equation of state of adsorbed layers will be studied by measuring the temperature variation of the mean square fluctuation. Field emission spectroscopic measurements will study the effect of metallic adsorbates on the surface resonance on tungsten and molybdenum planes. This resonance seems to survive to monolayer coverages for 'tungsten-like' adsorbates and one can obtain information about self-consistent potential at adsorbate atoms, using the resonance as a probe. Other electron impact desorption and low-temperature adsorption experiments are planned. This research is a continuation of that currently supported by Foundation Grant, CHE-7412059.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

3.0007, FLOW LEADING TO FRACTURE

P.P. GILLIS, Univ. of Kentucky, School of Engineering, *Lexington, Kentucky* 40506 (DF049330; AF-AFOSR-3379-77)

AF function - aerospace vehicles require an improved understanding of fracture and flow leading to fracture so that designs of enhanced durability can be achieved. Deficiency - current design methods are based on technological results that are empirical in nature and without definitive theory. The theory of flow leading to fracture is quite controversial and a detailed scientific arbitrage is both timely and worthwhile. Objective - the principal goal of this research consists of a critical review of the conflicting theories to determine precise differences for the best probability of conformance with reality. In particular, this research will investigate the strain-rate effects on plastic instabilities and attempt to sort out important distinctions between the theories of Hart, Budiansky, Ghosh and Demeri. How work contributes - the payoff here lies in the area of enhanced workability for metals and their alloys. If the plastic flow that leads to structural instability and fracture can be improved, then malleability or ductility will also improve. This is to say that, as the strain rate sensitivity decreases, the strain hardening response improves to allow higher yields in deeper draws or deformation for all ductile alloys.

In the main, this research program is composed of three parts, viz. (1) review of the existing controversial theories, (2) three-dimensional numerical computations to evaluate stress triaxialities beyond the point of instability and (3) validation of theory and practice through actual experimentation with thin sheet and bar.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0008, MATERIALS SUPPORT TECHNOLOGY - MICROSTRUCTURAL ANALYSIS OF SURFACE LAYER AND ITS EFFECT ON CRACK PROPAGATION

S. WEISSMANN, Rutgers The State University, School of Engineering, *New Brunswick, New Jersey* 08903 (DN775284; N0014-77-C-0191)

Alloys used in naval systems often fail by a fatigue mode. The ability to predict when a part will fail by fatigue would be a great asset since replacement could then be effected prior to failure during routine maintenance. This predictive capability does not presently exist. This research is an attempt to provide such a capability.

Microbeam X-ray and double-beam X-ray diffraction techniques will be investigated to determine their feasibility as means to nondestructively assess the cumulative damage (dislocation density) in alloys subject to fatigue testing. It is proposed to test the theory (developed using destructive techniques) that fatigue cracking occurs when the surface stress due to excess dislocation density reaches a specific value dependent only on the alloy. The effect of environment on the damage process is of particular interest. Selected steels, aluminum, and titanium alloys are to be investigated.

ADDENDA: Supporting agency address is: Office of Naval Research, Arlington, VA 22217

SUPPORTED BY U.S. Dept. of Defense, Navy

3.0009, HYGROTHERMAL COUPLING EFFECTS ON COMPOSITE MATERIALS

G.C. SIH, Lehigh University, Inst. of Fracture & Solid Mech, *Bethlehem, Pennsylvania* 18015 (DF047520; F49620-77-C-0054)

AF function - advanced aerospace vehicles will require improved performance and durability in the future. Deficiency - there is a lack of knowledge related to the behavior of advanced composites when exposed to high humidity and elevated temperature. Objective - to develop a mathematical model of the response of composites to hygrothermal coupling. How work contributes - this research contributes to the Air Force R&D effort to utilize advanced composites on aerospace vehicles.

Analysis techniques will be developed to consider the combined effects of moisture absorption and elevated temperature on composites. The analysis of these two effects will consider coupled behavior. Plate structures will be used in the analysis and utilize symmetric and unsymmetric surface exposure. In addition, sudden surface temperature changes will be considered and their influence on the spatial distribution of stress, strain, heat and concentration studied.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NA Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

3.0010, HIGH POLYMERS BASED ON PHOSPHAZENE AND OTHER INORGANIC SYSTEMS

H.R. ALLCOCK, Penn. State University, School of Science, *University Park, Pennsylvania* 16802 (NSG 2241)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

3.0011, DELIVERY OF JET FUEL FOR TESTING OF SET NOISE

UNKNOWN, U.S. Dept. of Defense, Aerospace Fuels Petr. Sup. Off, *Alexandria, Virginia* 22314 (AS-40065; FA59674 (TRAIS NO.))

SUPPORTED BY U.S. Dept. of Transportation, Office of the Secretary

3.0012, THE INCORPORATION OF METAL IONS POLYIMIDES

L.T. TAYLOR, Virginia Poly. Inst. & St. U., School of Arts & Sciences, *Blacksburg, Virginia* 24061 (NSG 1428)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and

Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, ANALYSIS OF A FREE-FLIGHT ROCKET LAUNCHER DESIGN CRITERION
J.E. COCHRAN, Auburn University, Engineering Experiment Station, *Auburn, Alabama* 36830 (DA0L4990)

To develop methods to estimate free-flight rocket systems impact dispersions. These methods will couple the launch-phase errors to the free-flight errors in a manner usable by design engineers. Effects of rocket flexibility on the launch-phase errors will be defined.

Models previously developed by Auburn University will be exercised, expanded and utilized to determine the causes and effects of launch-phase errors on impact dispersions. Current models include rocket thrust misalignment and dynamic unbalance effects. The expanded models will include effects of rocket bending or flexibility on launch-phase errors. The complex models will be simplified, while retaining the more significant errors sources, to a form readily usable by design engineers.

ADDENDA: Supporting agency address is: MIRADCOM GE&MS Directorate, Technology Lab, Redstone Arsenal, AL 35809

SUPPORTED BY U.S. Dept. of Defense, Army

4.0002, EVALUATION OF INDUCTION MOTORS WITH ELECTRONIC CONTROLS
UNKNOWN, Auburn University, Graduate School, *Auburn, Alabama* 36830 (NCA 8-128)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

4.0003, FLOW-FIELD COMPUTATIONAL METHODS FOR MISSILE LAUNCH AND TRANSONIC FLIGHT
B.Z. JENKINS, U.S. Army, Aeroballistics Directorate, *Huntsville, Alabama* 35809 (DA0F1294)

To be able to predict the aerodynamic behavior of missiles while in the influence of disturbing effects due to launch environment during the low-speed acceleration phase of flight and during the transonic speed range.

Computer programs will be acquired and adapted to meet AMICOM requirements. This will be supplemented by in-house programs to incorporate other lines of analytical research and to carry out corroborating experiments.

ADDENDA: Supporting agency address is: MIRADCOM Aeroballistics Directorate, Redstone Arsenal, AL 35809

SUPPORTED BY U.S. Dept. of Defense, Army

4.0004, SIMULATOR FOR AIR-TO-AIR COMBAT SYSTEM RESPONSE
W.J. HOPKINS, U.S. Air Force, Human Resources Laboratory, *Chandler, Arizona* 85224 (DF223400)

To document the performance of the simulator for air-to-air combat's six-degree-of-freedom motion system and to investigate and describe the motion platform drive algorithms and hardware.

Accelerometers will be affixed to the motion platform. Specified sinusoidal and step inputs will replace selected pilot control inputs to determine flight equation and motion system frequency response, amount of lag and to assess motion system fidelity during selected maneuvers. The results of this work will provide the basis for software/hardware modifications to the motion system to improve training. They will aid in the interpretation of training-effectiveness studies and motion-system evaluations.

ADDENDA: Supporting agency address is: AF Human Resources Laboratory FTO, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0005, LASER-INDUCED FLUORESCENCE SPECTROSCOPY FOR MAKING IN-SITU SPECIES CONCENTRATION MEASUREMENTS IN TURBULENT COMBUSTION FLOWS
J.W. DAILY, Univ. of California, School of Engineering, *Berkeley, California* 94720 (DF049060; AF-AFOSR-3357-77)

AF function - advanced diagnostic techniques, advanced air-breathing engines, weapon delivery and defense. Deficiency - inability to obtain reliable measurement of important parameters in turbulent reacting flows in practical hostile combustion environment via present-day measuring and diagnostic techniques, inability to reliably evaluate combustion models. Objective - to develop sensitive selective, precise, reliable and rapid diagnostic methods for measuring important parameters in jet engine reacting flow environment. To determine feasibility of using laser-induced fluorescence spectroscopy (LIFS) for obtaining high spacial and time resolution in-situ species concentration measurements in practical combustion environments, to determine capabilities and limitations of LIFS as a laboratory diagnostic tool, to provide reliable experimental data to the combustion modeler. How work contributes - will provide additional understanding and reliable data to permit realistic evaluation of analytical models of complex reacting flows, will help reduce development time and cost of air-breathing propulsion systems, will permit evaluation of capabilities and limitations of various diagnostic methods, will aid in development of improved or novel new in-situ nondisturbing techniques for accurately measuring turbulent reacting flow parameters.

Using laser-induced fluorescence spectroscopy techniques, measurements will be made of hydroxyl radical concentrations in two laboratory burners, one laminar and one turbulent. Standard burners will be used wherever possible. Initial work will involve examination of the OH spectrum in both flames, mapping interferences, temperatures, and concentrations using conventional absorption and emission spectroscopy. The OH fluorescence spectrum will then be measured in the laminar flame and saturation and trapping effects examined. Results will be used to optimize the excitation and detection schemes. Data acquisition electronics and signal processing will be developed. The system will be applied to the turbulent flame and fluorescence results compared with those from more conventional measuring techniques. The experimental procedures will be guided by and the results compared with a theoretical model that will be developed to describe the excited-state populations of OH. Additionally, theoretical predictions of turbulence results will be made using standard theory for comparison with experimental results.

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0006, CRYO-COOLANT HELIUM SUPER CONDUCTOR INTERACTION
T.H. FREDERKING, Univ. of California, School of Engin. & Appl. Sci., *Los Angeles, California* 90024 (NSG 3153)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

4.0007, SPACELAB INFRARED TELESCOPE POINTING AND CONTROL SYSTEM
J.D. POWELL, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2246)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

4.0008, ADVANCED HIGH-POWER GENERATOR FOR AIRBORNE APPLICATIONS
F. ECHOLDS, Garrett Corporation, *Torrance, California* 90509 (DF460150; F33615-76-C-2168)

To demonstrate that an ultralightweight non-superconducting generator in the 1 to 10 megawatt power range can be built by fabricating and testing the rotor, which is the most critical part of the generator design. The goal is a generator specific weight of 0.1 lb/kw.

The approach will consist of utilizing advanced concepts such as enhanced conductor cooling, high-energy product mag-

nets, high rotor tip speeds and others. The specific design concept has not been determined since a contract has not yet been awarded.

ADDENDA: Supporting agency address is: AF Aero-propulsion Laboratory POD, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0009, ENERGY TRANSFER LASER STUDIES

S. LEONE, Univ. of Colorado, Graduate School, *Boulder, Colorado* 80302 (DF902340; F19628-77-C-0034)

AF function - surveillance, reconnaissance. Deficiency of opportunity - unable to identify aircraft at long ranges. Objective - to determine the processes and rates appropriate to making efficient ir lasers based on electronic to vibrational energy transfer. How research contributes - work will lead to the identification of ir laser sources of potential application in ir laser radar or communications.

The research effort will measure the rates of electronic to vibrational energy transfer and deactivation in atomic and molecular systems. Emphasis will be placed on studying systems which can produce a suitable laser radar source in the infrared.

ADDENDA: Supporting agency address is: Rome Air Development Center ETS, Griffiss AFB, N Y 13440

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0010, STUDY OF THE ELECTRONIC PROPERTIES IN THE ELECTRON AND PROTON IRRADIATED GAALAS SOLAR CELL MATERIALS

S.S. LI, State University of Fla. Sys., School of Engineering, *Gainesville, Florida* 32611 (NSG 1425)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

4.0011, IGNITION AND COMBUSTION OF FUEL SPRAY JETS

C.K. LAW, Northwestern University, Technological Institute, *Evanston, Illinois* 60201 (ENG77-01068)

The objective of this combined theoretical-experimental program is to study the ignition and combustion characteristics of a fuel droplet in a reactive atmosphere, and of a reactive gaseous jet in an oxidizing environment. The results from this study will serve as inputs to future studies on the ignition and combustion of fuel spray jets. Particular emphasis will be placed on resolving the present controversy regarding the actual existence of the individual droplet combustion made within the fuel rich spray interior. Research efforts in the present study will involve (1) the design and fabrication of a suspended droplet apparatus, and preliminary experimentations, and (2) a theoretical study of the combustion characteristics of a gaseous fuel jet. Ignition criteria governing both systems will be determined.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0012, AN/ARC-164 TRANSMITTER STUDY

G. JOHNSON, Magnavox Company, *Fort Wayne, Indiana* 46804 (DF737300; F30602-77-C-0076)

The objective of this effort is to study, investigate, and analyze the problem of spurious and broadband noise outputs associated with the new generation of solid-state uhf replacement radios. This effort will be directed at developing the technology required to reduce these unwanted outputs to -90 dbm and -125 dbm/hz, respectively. This technological advance is required to provide electromagnetic compatibility between this type of equipment and ultra-low noise receiving systems used on Air Force command and control aircraft.

An RADC in-house measurement program has verified that the Magnavox AN/ARC-164 solid-state transmitter generates the highest level of spurious and broadband noise outputs of all the new replacement radios. For this reason it was picked as the candidate for this study. The approach is to award a 9-month sole-source contract to Magnavox to study, investigate and analyze this severe EMC problem, and to develop the technology required to achieve electromagnetic compatibility. This technology will be applicable to other solid-state broadband replacement radios.

ADDENDA: Supporting agency address is: Rome Air Development Center RBC, Griffiss AFB, N Y 13440

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0013, THE INTERACTION OF A SPACECRAFT WITH ITS ENVIRONMENTAL SPACEPLASMA

U. SAMIR, Univ. of Michigan, School of Lit. Sci. & The Arts, *Ann Arbor, Michigan* 48104 (ATM76-19790)

This grant funds a theoretical and data-analysis study of the interaction of spacecraft with the electrons and ions through which the spacecraft pass. Data taken by the Atmospheric Explorer satellites will be used. These will be tested against theoretical models. The spacecraft collect charge, severely impacting many experiments, so advances in understanding the associated phenomena will aid in interpreting data from past experiments and in planning new ones.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

4.0014, STATIC ELECTRICITY HAZARDS IN AIRCRAFT FUEL SYSTEMS

W.G. DUKEK, Exxon Res. & Engineering Co., *Linden, New Jersey* 07036 (DF461630; F33615-77-C-2046)

Define design criteria for USAF fuel systems to decrease fuel static electricity hazards. Determine compatibility of existing aircraft fuel systems with fuels having wide range of electrical conductivity.

Contract to Exxon Res. and Engr. Co. to conduct series of experimental tests to determine good and bad design practices.

ADDENDA: Supporting agency address is: AF Aero-propulsion Laboratory SFF, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

4.0015, TWO-POINT DIFFUSION FOR TWO-DIMENSIONAL TURBULENCE

R.L. PESKIN, Rutgers The State University, School of Engineering, *New Brunswick, New Jersey* 08903 (ATM76-18899 A01)

The objective of the proposed research is to investigate the mechanics of relative (two-point) dispersion in two-dimensional turbulence. The research effort would consist of a numerical simulation study of two-point Lagrangian motion in two-dimensional turbulence using modifications of developed wave-space codes. A similar study using an available hemispheric barotropic model would also be carried out. Analysis of balloon trajectory data from the TWERLE balloons released would be undertaken to ascertain the two-point dispersion behavior of such balloons and to determine appropriate dispersion laws. This work would also relate actual balloon dispersion data to theoretical estimates and estimates obtained from numerical simulation.

Applications of this research include a better understanding of the mechanisms controlling dispersion of pollutants in the stratosphere, and knowledge of the relative dispersion estimates which must necessarily be employed if horizontal convergence information is to be obtained from multiple balloon trajectories.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

4.0016, COHERENT ANTI-STOKES RAMAN SCATTERING FROM SURFACES

R.B. MILES, Princeton University, School of Engin. & Appl. Sci., *Princeton, New Jersey* 08540 (ENG76-01460 A01)

Coherent anti-Stokes Raman scattering will be investigated as a tool for observing molecules adsorbed onto metal surfaces. Two high-intensity laser beams mix together to generate light characteristic of the vibrational models of the adsorbed species and unmasked by flourescence. Two configurations are proposed to enhnce the otherwise low scattered intensity. A waveguide maintains high intensities over long distances and permits the coherent anti-Stokes beam to build up over a relatively long path.

Picosecond high-power pulses increase the strength of the interaction and thus the amount of scattered light and only damage the material after the pulse has terminated. Moving the sample, therefore, allows numerous data points to be taken before the sample is destroyed. Initial experiments will be conducted with pyridine adsorbed onto alumina so comparison with standard Raman surface studies will be straightforward.

This is a continuation of work initiated under grant ENG-7601460.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0017, DEVELOP AND TEST MATHEMATICAL MODELS OF THE THREE-DIMENSIONAL FLOW FIELD AND PARTICLE MOTIONS
D.A. SAVILLE, Princeton University, School of Engin. & Appl. Sci., *Princeton, New Jersey* 08540 (NAS 8-32614)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

4.0018, ION HEATING BY STRONG COLLISION-FREE SHOCK WAVES
D.L. MORSE, Cornell University, School of Engineering, *Ithaca, New York* 14850 (ENG76-14999)

This program consists of a combined theoretical and experimental investigation of the dynamics of, and ion heating in, strong magneto-plasma shocks. The ion energy distribution in a strong, long-duration laboratory plasma shock with collision-free ions will be measured, along with other plasma and field parameters at the shock. Comparison of these data with computational simulations and analytic results will be made. The goal is to understand the mechanisms by which the relatively cold, streaming ions of the upstream plasma are converted to the hot, slowly drifting ions behind the shock.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0019, DESIGN FEASIBILITY OF HIGH-POWER LIGHTWEIGHT DC-TO-DC CONVERTERS FOR SPACE POWER APPLICATIONS
T.G. WILSON, Duke University, School of Engineering, *Durham, North Carolina* 27706 (NSG 3157)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

4.0020, ANALYTICAL TECHNIQUES FOR DETERMINING NEAR FIELD ANTENNA CHARACTERISTICS
W.D. BURNSIDE, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (DN790023; N00019-77-C-0299)

To develop an analytical technique for determining near-field antenna patterns for communication antennas mounted on an aircraft body. A knowledge of the near-field characteristics would significantly improve the present state-of-the-art in designing aircraft antennas, from the standpoint of both performance and expense because the characteristics could be determined more accurately without expensive modeling.

The near-field antenna problem will be initially separated into two parts, a finite flat plate and an elliptic cylinder. Geometric theory of diffraction techniques will be used to determine the Green's functions for such finite shapes. These results will then be combined such that the near-field solutions for an elliptic cylinder with attached flat plates can be obtained.

ADDENDA: Supporting agency address is: Naval Air Systems Command, Washington, DC 20360

SUPPORTED BY U.S. Dept. of Defense, Navy

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, STRATOSPHERIC AEROSOL AND GAS EXPERIMENT
B.M. HERMAN, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (NAS 1-14928)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

5.0002, ENERGETIC PARTICLE PRECIPITATION EFFECTS ON STRATOSPHERIC AND MESOSPHERIC COMPOSITION AND DYNAMICS
R.M. THORNE, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (NSG 5190)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

5.0003, NORTH PACIFIC EXPERIMENT (NORPAX) - AIRCRAFT MONITORING OF THE EQUATORIAL CURRENTS DURING THE NORPAX TEST SHUTTLE
W.C. PATZERT, Univ. of California, Scripps Inst. of Oceanography, *San Diego, California* 92038 (OCE76-80183)

This project is part of the North Pacific Experiment (NORPAX). The long-range goal of NORPAX is to understand fluctuation in the upper layers of the Pacific Ocean with time scales of months to years and space scales in excess of 1,000 kilometers, and the relationship of these oceanographic fluctuations to the overlying and adjoining atmosphere. Achievement of this goal should eventually lead to improved weather/climate prediction for both the Pacific Ocean and North America.

As part of NORPAX this project will obtain data from aircraft on the large-scale characteristics and variability of the oceanic temperature field during the NORPAX-FGGE test shuttle. The objective of the shuttle is the design of a proper observational program to monitor the low-frequency (months to years) fluctuations of the equatorial Pacific oceanic circulation with the aim to understand its dynamics. The component proposed here consists of ocean and atmospheric measurements from NOAA and Navy aircraft. These data would be obtained during flights between Honolulu, Hawaii and Papeete, Tahiti beginning in November, 1977 and ending in February, 1978. The primary oceanic measurements will be closely spaced AXBT soundings sampled primarily along north-south sections repeated at time intervals varying from daily to weekly.

SUPPORTED BY U.S. National Science Foundation, Div. of Ocean Sciences

5.0004, GRAVITY-WAVE INTERACTION WITH STORMS
W.H. HOOKE, U.S. Dept. of Commerce, Environmental Research Labs., *Boulder, Colorado* 80302 (8C37 15 75)

PROJECT OBJECTIVE: To determine the nature of gravity-wave interaction with severe storms, and to assess the possible implications of this interaction for operational mesoscale weather forecasting.

CURRENT YEAR PLAN: 1. Analyze WPL/NHRE microbarograph data. 2. Analyze NSSL mesonet data using array-processing algorithms to examine space-time covariance, under both storm and non-storm conditions.

PROGRESS REPORT: Deployment of a microbarograph array in the WPL/NHRE network, for data collection on mesoscale pressure fluctuations and comparisons with measurements made by other remote sensors.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Labs.

5.0005, GEOPHYSICAL INSTRUMENTATION AND FIELD SUPPORT
F.C. FRISCHKNECHT, U.S. Dept. of The Interior, Geological Survey, *Denver, Colorado* 80225 (9780-01759)

STATES TO WHICH PROJECT PERTAINS: Colorado directly. This project supports other projects which have field activities.

Major objectives are to complete development of a calculator-based I.P./EM receiver with field processing capabilities, to package an airborne gamma spectrometer system, and to maintain existing equipment.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0006, QUANTITATIVE MAGNETOSPHERIC B-FIELD MODELS FOR THE INTERNATIONAL MAGNETOSPHERIC STUDY

J.G. ROEDERER, Univ. of Denver, School of Arts & Sciences, *Denver, Colorado* 80210 (ATM76-00220 A01)

For many research purposes, both theoretical and experimental, it is necessary to have a mathematical model of the Earth's magnetic field. A model in this sense means a numerical algorithm (e.g., a computer program) that, given the coordinates of a point in space, will return the value of the vector magnetic field at that point. There currently exists a fair variety of such models, with widely varying properties, accuracies, and features. This grant funds a program of systematic evaluation, testing, intercomparison, and updating of these models. The objective of this work is to establish a series of magnetospheric models with clearly defined experimental studies of: effects of the interplanetary magnetic field on Earth's magnetic field, ring current configurations, and neutral sheet current distributions.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0007, MICROWAVE FORWARD SCATTER FROM THE OCEAN

C.I. BEARD, U.S. Navy, Res. Laboratory, *Washington, District of Columbia* 20375 (DN780053)

The general objective is research in electromagnetic (em) wave propagation and scattering by the surface of the ocean. Specifically this is an investigation into microwave forward coherent reflection and incoherent scattering from the ocean. This work will necessarily include scattering from convective cells over the ocean and possible coupling effects between the inversion layer and the evaporative layer, as these phenomena may interact with the ocean scattered fields.

Theoretical treatment of forward scattering from the ocean is being carried out, and an experiment is being planned to measure forward coherent reflection and incoherent scattering using nanosecond pulses.

ADDENDA: Supporting agency address is: Naval Research Laboratory (4000), Washington, D.C. 20375

SUPPORTED BY U.S. Dept. of Defense, Navy

5.0008, AUTOMATIC FACTOR MAPPING

M.T. COOPER, U.S. Navy, Coastal Systems Laboratory, *Panama City, Florida* 32401 (DN788045)

The objective of this task is to identify procedures consistent with reconnaissance capability projected for the amphibious forces in 1985-90 for obtaining data from which tactical factor maps of an AOA can be prepared, to identify procedures for automatically processing the data, integrating it with information already available, and displaying it to tactical commanders.

Approach is to concentrate on defining factors and information structures geared to Marine Corps needs. Factors will be analyzed sequentially, with remote data sensing methods defined and proposed techniques tested by piggybacking on NCSL-organized remote sensing flyovers.

ADDENDA: Supporting agency address is: Naval Coastal Systems Laboratory 101, Panama City, Florida 32407

SUPPORTED BY U.S. Dept. of Defense, Navy

5.0009, SNOW SHOWER CLOUD PHYSICS IN THE LEE OF LAKE MICHIGAN

R.R. BRAHAM, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (ATM77-21464)

The intense snow storms generated on the lee shore of Lake Michigan during early winter months, when cold air flows over the relatively warm lake, will be investigated using the CHILL dual-wavelength, Doppler radar and an instrumented airplane. Objectives include delineation of the internal circulation of the storm clouds and study of the cloud physics of snow nucleation and growth. The project will cooperate with an ERDA-sponsored study of air pollution scavenging by the same storms.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0010, THE EFFECTS OF URBAN-INDUSTRIAL EMISSIONS ON DOWNWIND WEATHER PATTERNS

R.R. BRAHAM, Univ. of Chicago, School of Physical Sciences, *Chicago, Illinois* 60637 (ENV77-06500)

Inadvertent modification of many local weather elements by cities has been established and modification of some weather elements at extended distances downwind of large urban-industrial areas is indicated. This research is investigating the modification of cloud condensation nuclei, ice forming nuclei, Aitken particles, large aerosol particles, cloud drop spectra and snow crystal characteristics, in the plumes from Chicago and Milwaukee after they have crossed Lake Michigan in winter. Measurements are made with an instrumented cloud physics aircraft flying multilevel transects normal to and parallel to the urban plumes.

A secondary effort involves the continuation of numerical modeling of urban cumulus clouds and of urban boundary layer dynamics. The modeling work integrates previous measurements of summer cloud modification in the St. Louis area and also provides a basis for developing model simulations of the present field observations.

SUPPORTED BY U.S. National Science Foundation, Div. of Advanced Environmental Research & Technology

5.0011, CAUSES AND IMPACTS OF URBAN INFLUENCES ON PRECIPITATION

S.A. CHANGNON, State Water Survey, *Urbana, Illinois* 61801 (ENV77-15375)

Past research on urban effects on summer weather in the St. Louis area has delineated anomalous features in the thermal, moisture, airflow, precipitation and severe weather patterns. Initial hypotheses explaining the causes of these anomalies have been presented.

This research focuses on four major efforts: (1) intensive studies of selected cases of St. Louis data to further sharpen hypotheses explaining the anomalies defined to date (30% increase in summer rainfall, 50% increase in heavy rainstorm, and 200% increase in hail); (2) analysis of the extensive weather data base (radar, raingage network, satellite, wind, and temperature) available for the Chicago region and comparing and integrating the results of the St. Louis and Chicago studies to sharpen urban weather hypotheses and test the transferrability of concepts derived for St. Louis; (3) economic and institutional response studies of the impacts of the precipitation anomalies and the precipitation-related pollutants in the region of urban modified weather; (4) dissemination of key results to local, regional and national groups affected by altered weather.

SUPPORTED BY U.S. National Science Foundation, Div. of Advanced Environmental Research & Technology

5.0012, RECLAMATION OF SURFACE MINED LAND

I.J. JANSEN, Univ. of Illinois, Agric. Experiment Station, *Urbana, Illinois* 61801 (0071252; ILLU-15-0331)

OBJECTIVE: Characterize strip mine spoils. Relate their properties to geographic region, pre-mine landscape, overburden materials, coal strata mined, mining procedure, age of spoils. Identify factors that limit stand establishment, crop performance, farming operations. Determine rate of organic matter accumulations, structure development, weathering down of compaction zones and shale fragments, chemical changes in mine spoils. Relate physical properties of reclaimed soils to soil moisture content at time of mining and grading.

APPROACH: The significance of reclamation practices and effect of soil development over time will be determined by observing near-surface features of spoils that vary in age. Hydrology and soil moisture characteristics of disturbed lands will be determined. Procedures include root system development studies, field and laboratory soil analysis and use of remotely sensed imagery.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Illinois

5.0013, LIGHT SCATTERING BY SMALL PARTICLES
P. CHYLEK, Purdue University, Graduate School, *Lafayette, Indiana* 47907 (ATM76-22028)

Radiative transfer calculations for the earth's atmosphere become exceedingly difficult if they attempt to account for the effect of scattering and absorption by non-spherical aerosol particles. The same difficulty arises in the interpretation of remote sensing data. Such calculations are, however, important for understanding the effects of aerosols in the earth's atmosphere or, for example, the effects of dust storms on the Martian atmosphere. There appears to be no feasible procedure for calculating the needed scattering parameters for non-spherical polydispersions. Recently, however, a simple modification to Mie theory was suggested (Chylek 1976) that seems to properly correct for the nonsphericity of the particle shape. The goal of the proposed research is to: (a) refine the modification to Mie theory that corrects for non-spherical particle shape, (b) to discover the limitations, if any, to its applicability, and (c) to establish a firm theoretical foundation for the modification procedure.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0014, THE SOIL MOISTURE/PLANT WATER/ATMOSPHERIC ENVIRONMENT INTERACTION
R.H. SHAW, Iowa State Univ. of Sc. & Tech, Agric. Experiment Station, *Ames, Iowa* 50010 (0063481; IOW01989)

OBJECTIVE: Refine and improve the understanding of the soil moisture, plant water, atmospheric environment interaction in Iowa.

APPROACH: Several weighting techniques will be examined for use with the moisture stress index and evaluated by relating to corn yields. An excess soil moisture index will be calculated and related to corn yields. Differential watering of field plots (weather shed) will be used to provide a range of stress levels to relate plant parameters and yield response. These data will also serve as ground truth data for remote sensing studies.

PROGRESS: Determination of moisture characteristic curves was completed for 8 soil types ranging from a sandy to a heavy clay soil. Selected sites were sampled for soil moisture in mid-April and mid-October with a few sites sampled in early August. Soil moisture reserves in October were good in parts of southern and north-central Iowa, but were generally low in a wide band across the central part of the state. Stress indices are being calculated from these data to determine the stress conditions which occurred in 1975. Observations were taken on the development and yield of Hark and Rampage soybeans subjected to moisture stress. Stress was induced on four different sets of plants for periods starting in mid-July, late July, mid-August and late August. The stress periods ranged from 4 to 8 days in duration, the type of weather determining the duration. Stress was obtained by using 5 levels of watering in 35 gallon containers located under a movable weather shed. Except for the short stress periods, the plants were well watered. During the stress periods, soil moisture was determined daily and leaf water potential and stomatal resistance monitored several times daily. Yields were obtained from the branches and 3 equal segments of the plants in each container. The number of pods, beans and weight of beans was determined for each segment. Leaf water potential, stomatal resistance, radiation data and leaf area were monitored in conjunction with a rooting study being conducted in western Iowa. (Coop. Proj. 2083).

SUPPORTED BY Iowa State Government

5.0015, STRUCTURAL STUDY OF THE KENTLAND, INDIANA IMPACT STRUCTURE
W.R. VANSCHMUS, Univ. of Kansas, Graduate School, *Lawrence, Kansas* 66044 (NSG 7351)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

5.0016, TYPHOON INVESTIGATIONS
T.J. KEEGAN, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249510)

AF function - weather observing, analysis and forecasting for military operation. Deficiency - lack of adequate information to meet military weather support requirements. Objective - to develop techniques and equipment to more fully exploit meteorological satellite data for typhoon analysis and forecasting. How development contributes - allows substitution of satellite observations for reconnaissance flights in typhoon analysis and forecasting.

Satellite imagery will be examined to determine its utility in defining the location, intensity, wind field and future movement of tropical cyclones. The MCIDAS system will be used to provide the data management and processing capability needed to investigate the relationships between the detailed and large-scale cloud fields and tropical cyclone characteristics. Analytical techniques will also be investigated which have application to tropical as well as extratropical meteorology. This is a continuation of the work formerly performed under IHWU 66980203, which was terminated for administrative reasons.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LY, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0017, INFRARED HORIZON OF THE EARTH
B.D. SCHURIN, U.S. Air Force, Geophysics Laboratory, *Bedford, Massachusetts* 01730 (DF249290)

AF function - surveillance, reconnaissance, detection, guidance and navigation. Deficiency - uncertainties in infrared horizon profile now severely limit accuracy of horizon sensors, and interfere with target acquisition by near-horizon surveillance systems. Research - carry out rocket measurements of the infrared radiance of the earth's horizon and develop infrared horizon profile models for the earth's atmosphere. How research contributes - permits development of more accurate horizon sensors and more effective target detection systems. The results of this effort provide the basic infrared radiance characteristics for the earth's upper atmosphere which are currently not available. It provides the radiance background against which AF systems will have to operate as well as the transmission characteristics of the atmosphere through which they will have to carry out their missions.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory OP, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0018, DMSP IMAGERY PROCESSING TECHNIQUES
UNKNOWN, Bolt Beranek & Newman Inc., *Cambridge, Massachusetts* 02138 (DF246140; F19628-76-C-0124)

AF function - DMSP imagery techniques for real-time processing. Deficiency or opportunity - inadequate techniques for the automatic extraction of information from DMSP satellite imagery. Objective -define imagery processing techniques that are best suited to real-time operations and problems of users of DMSP imagery data. How development contributes - increases amount of satellite imagery information available in usable form on a real-time basis.

Obtain two-dimensional spectral estimates with fast Fourier transform techniques. Characterize types of spectral features that provide discriminable signatures for a wide variety of cloud patterns. Develop a scheme for incorporating signature information into a cloud and weather classifications analysis.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LY, L G Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0019, ULTRAVIOLET SPECTROMETER
J.P. PADUR, Comstock & Wescott Inc., *Cambridge, Massachusetts* 02138 (DF249980; F19628-76-C-0294)

AF function - vehicle tracking during flight and reentry, trajectory prediction, communication systems. Deficiency - present atmospheric models predict only slight variability of the density of the upper atmosphere below 200 km; however, empirical data show this conclusion to be incorrect and observations indicate density changes as great as 50 percent in both space and time at altitudes between 120 and 200 km. This altitude region, important for Air Force operations, will be studied on a worldwide basis by density experiments aboard the DMSP satellites. The present work will support these experiments. Objective -insitu measurements with rockets of atmospheric parameters to provide correlative data for comparison with photometric data from DMSP satellites. How research contributes - provides direct, low-altitude measurements of pertinent atmospheric properties as an aid in understanding the remote optical measurements made from DMSP satellites.

Contractor shall design, fabricate and test a double-deck solar euv spectrometer (55 to 1206 Angstroms) and a uv photometer (1450 Angstroms), integrate them with an electron analyzer, a dayglow photometer and an electronics subsystem. With this rocket payload, measurements will subsequently be made of the photoelectron flux and differential energy distribution for energies between 0 and 100 electron volts, of the radiance of nitrogen airglow at 3371 Angstroms and of the density and composition of the upper atmosphere as established by solar ultraviolet photon absorption rates. All measurements will be made from a single rocket payload in the altitude range between 120 and 200 km.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LKO, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0020, STUDIES OF CUMULUS CONVECTION AND MESOSCALE PRECIPITATION AREAS IN GATE
P.M. AUSTIN, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (ATM77-12534)

The objectives of this research are to: (1) provide a statistical description of typical precipitation structures in the tropics; (2) determine the distribution of precipitation and clouds in selected tropical disturbances; and (3) to estimate the vertical transports of heat and momentum in those clouds. The data used will be derived from observations collected and processed by the principal investigators during the field phase of the GARP Atlantic Tropical Experiment (GATE). These observations include continuous radar as well as periodic dropsize measurements. The ultimate goal of this research project is to explore the relation of tropical precipitation structures to atmospheric circulations on various scales of motion. This will be addressed in a future proposal.

This research is the first step towards addressing one of the primary objectives of GATE: to better understand the interactions between individual, small-scale convective systems such as cumulus clouds and their associated precipitation structure, and larger-scale weather systems.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0021, SCIENCE SUPPORT FOR THE STRATOSPHERIC AEROSOL AND GAS EXPERIMENT
D.M. CUNNOLD, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (NAS 1-14932)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

5.0022, METEOROLOGICAL STUDIES
L. BURKE, Regis College, Undergraduate School, *Weston, Massachusetts* 02193 (DF248460; F19628-77-C-0010)

AF function - weather analysis, forecasting and observing for military operations. Deficiency - inadequate weather forecasts and observations. Research - applies advanced techniques to development of improved weather analysis forecasting and observing techniques. How research and development contribute - provide improved weather analysis forecasting and observing techniques in the following areas: mathematical models of atmospheric processes (T2320G2), DMSP satellite imagery and use of AFGL man-computer interactive data access system (MCIDAS) to improve satellite imagery (T669802), application of objective computer methods to aviation terminal weather (T862811), and assess environmental impact of man-made perturbations of the stratosphere (T668709).

Computerized objective methods will be used in the development of methods to combine, analyze and display estimates of cloud properties derived from satellite data (627A).

ADDENDA: Supporting agency address is: AF Geophysics Laboratory LY, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0023, DESIGN AND DEVELOP SPACE VEHICLE EXPERIMENTS
L. BURKE, Regis College, Undergraduate School, *Weston, Massachusetts* 02193 (DF249550; F19628-77-C-0122)

AF function - surveillance, communication, navigation, ionosphere and magnetosphere modelling. Deficiency - inadequate knowledge of satellite environment interactions and ionosphere-magnetosphere electrical properties for operational needs of AF systems. Objective -design rocket, satellite and shuttle experiments for the study of plasma motions, electric fields, electron hole generation, irregularities and high-latitude current systems. How research contributes - improves Air Force space vehicle reliability and survivability, provides data essential for the design and high performance of communication, guidance and surveillance systems under normal and disturbed conditions, contributes to the development of Air Force operational ionosphere prediction programs and to the solution of spacecraft charging problems.

Design and develop solution rocket, satellite and shuttle experiments for the study of dynamical processes in the ionosphere and magnetosphere, space vehical-environment interactions, generation and monitoring of atmospheric perturbations. Analyze and synthesize space flight results.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PHR, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

5.0024, TROPOSPHERIC CHEMISTRY
D.H. STEDMAN, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (ATM76-03793 A01)

This research consists of a collaborative experimental and theoretical study of tropospheric chemistry. Several lines of investigation will be undertaken in the hope of elucidating the processes that control the abundances of ozone and the odd-nitrogen oxides in the troposphere. The experimental phase, a tropospheric chemical observatory, will be a mobile laboratory equipped to measure trace constituents, both ambient and pollutant, as well as to test theories of tropospheric chemistry. The theoretical portion of the study will be to determine an optimal model based on this and previous experimental findings. The results of this research should help to assess the roles which tropospheric photochemistry and stratospheric transport play in determining background ozone levels.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0025, DIRECT MEASUREMENTS OF PHOTOLYSIS RATES OF STRATOSPHERIC CONSTITUENTS
D.H. STEDMAN, Univ. of Michigan, School of Engineering, *Ann Arbor, Michigan* 48106 (NSG 5189)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

5.0026, MODEL DEVELOPMENT FOR THE AMTEX DATA e AIR-MASS TRANSFORMATION EXPERIMENT
J.W. TELFORD, Univ. of Nevada System, Desert Research Institute, *Reno, Nevada* 89507 (ATM77-10646)

The objective of this research is to develop, test and examine a model of the convective boundary layer of the atmosphere. The principal investigator collected aircraft observations in the boundary layer during the Air Mass Transformation Experiment (AMTEX), a regional subprogram of GARP carried out in the winter of 1975. This was a self-consistent set of observations which he has since processed. They provide an ideal base for boundary-layer model development and testing.

The model, which allows cloud formation and couples the planetary boundary layer to the underlying sea surface, will be used to study how the boundary layer develops, the way clouds are formed in the boundary layer, and whether advection of warm overlying air plays an important role in these processes.

This research addresses one of the primary objectives of AMTEX: to more fully understand and eventually simulate boundary-layer processes in regions of rapid air-mass modification. Such regions of the world (the East China Sea, Cape Hatteras) are characterized by frequent and intense storm development.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0027, MESOSCALE MODELING OF AIRFLOW OVER INHOMOGENEOUS TERRAIN
A. VAZIRI, Univ. of Nevada System, Desert Research Institute, *Reno, Nevada* 89507 (ATM76-02013 A01)

This grant is to conduct research in Mesoscale Modeling of Airflow over Inhomogeneous Terrain. The proposed research involves: A. Implementation of a two-dimensional (horizontal plane) convective boundary layer model of airflow over inhomogeneous terrain and its application to Lake Ontario (land-sea inhomogeneity). B. Investigation of the degree to which verification and modification of present parameterization techniques and interactions through an inversion layer can be improved. This will utilize the airborne data collected through the Desert Research Institute data acquisition system, flown on NCAR/Buffalo aircraft over Lake Ontario during a 1972 IFYGL project. C. The development of a three-dimensional airflow model which simulates the vertical structure of the atmosphere with the aim of elucidating the relative importance of the physical processes involved, as revealed by comparison with the measurements. D. Initial application of the model to the mountainous topography of Pyramid Lake, Nevada and comparison with some aircraft data.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0028, INVESTIGATION OF ATMOSPHERIC PLANETARY DYNAMICS
P.J. GIERASCH, Cornell University, School of Arts & Sciences, *Ithaca, New York* 14853 (NAS 5-23785)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

5.0029, MULTIEXPERIMENTAL STUDIES OF THE WIND AND WAVE PATTERNS IN THE UPPER ATMOSPHERE AND IONOSPHERE
M.C. KELLEY, Cornell University, School of Engineering, *Ithaca, New York* 14850 (ATM77-04518)

This grant funds an experimental and theoretical program of studies of the upper atmosphere and ionosphere. In particular, it funds: 1. a theoretical analysis of ion density, electric field, and neutral wind data taken in 1974-1975 in Greenland; 2. studies of plasma instability mechanisms for the generation of ionospheric irregularities; 3. continuation of a study of the global electric field system, involving measurements at the Jicamarca Radio Observatory in Peru (the only equatorial incoherent scatter radar site) as well as mid- and high-latitude radar facilities.

Successful progress on these problems will contribute significantly to the International Magnetospheric Study (IMS), and in general add to our knowledge of the dynamics of the Earth's upper atmosphere and ionosphere.

This work continues work funded under ATM-7504269.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0030, PHYSIOGRAPHIC CLASSIFICATION OF SOUTHERN FOREST LANDS
J.O. LAMMI, Univ. of North Carolina, School of For. Resources, *Raleigh, North Carolina* 27607 (0072105; NC01084)

OBJECTIVE: Organize known physiographic land patterns into a system of provinces, regions, and types having significance and utility for resource managers concerned with land classification and use. Develop a physiographic map of the Southern Region using the classification system developed in Objective A. Climatic zones having known relationships to forest composition and growth will be imposed on this map.

APPROACH: Available geological, topographic, soils, and vegetation maps and LANDSAT imagery will be utilized to develop the North Carolina contribution to this Regional Project.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, North Carolina

5.0031, AN INVESTIGATION OF SAMPLING AND DATA ANALYSIS PROBLEMS RELATED TO SATELLITE EXPERIMENTS FOR LONG-TERM RADIATION BALANCE OBSERVATIONS
F.B. HOUSE, Drexel University, School of Science, *Philadelphia, Pennsylvania* 19104 (8-661; 04-6-158-44061)

The investigation involves a continuation of the angular sampling problem or the radiation balance as it relates to the design of single-axis scanning radiometers on future satellites. The methodology for determining the optimum orientation of a scanner has already been developed and has been applied to simulated data based upon models of the angular reflection and emission patterns. Actual ERB data from Nimbus-6 will be analyzed similarly. Time series analysis of the radiation balance parameters, based upon observations by the fixed wide-angle radiometers of the ERB instrument will be performed. The data will be analyzed for different periodicities to determine their amplitude variation in time. Another aspect of this investigation is understanding changes in paleoclimate and predicted climate. The response of the radiation balance due to changes in solar isolation will be studied. Magnetic tapes and data summarized on punched cards will be furnished as they were under the previous phase of the grant.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0032, THE ROLE OF SOLAR RADIATION IN THE EPIDEMIOLOGY OF PLANT DISEASES
S.P. PENNYPACKER, Penn. State University, Agric. Experiment Station, *University Park, Pennsylvania* 16802 (0061126; PEN02052)

OBJECTIVE: Investigate the relationship of the electromagnetic spectrum to disease development in plants and plant populations. Develop methods for predicting plant disease epidemics based on solar radiation measurements.

APPROACH: The spectral distribution and intensity of available energy at the earth's surface and within various greenhouse structures will be correlated with the development of natural and experimental epidemics. These data will be used to construct a model for the prediction of future epidemics. The accuracy of the model will be tested by comparison of predicted values with real time values.

PROGRESS: Data collected by a multispectral scanner (MSS) on board the Earth Resources Technology Satellite was computer analyzed in a attempt to detect diseased vegetation. The MSS provided measurement of reflected and emitted electromagnetic energy from exposed soil and plant surfaces. The

four wavelength bands utilized were 0.5-0.6, 0.6-0.7, 0.7-0.8, and 0.8-1.1 um. Relative reflectance signatures for each of the four bands were obtainable for various degrees of altered plant communities but were not specific for disease damage. Similar signatures could also be caused by other factors which produce the same degree of vegetative stress, thereby necessitating ground truth data to minimize interpretation error. In the near-infrared wavelength bands, 0.7-0.8 and 0.8-1.1 um, the relative reflectance decreased as the amount of healthy vegetation decreased. This pattern was expected because healthy vegetation is highly reflective in the near-infrared region while areas of lesser vegetation and bare soil are relatively unreflective. The measured decline in reflectance within the near-infrared bands indicates that the signatures associated with various stages of vegetative decline were correct. Analysis of the data provided the capability to detect areas as small as 2.4 ha, if the spectral signatures contrast with those of the surrounding area. Therefore, due to resolution, the present system does not possess the capabilities required to provide the accurate and timely detection of initial decline.

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative State Research Service, Pennsylvania

5.0033, STUDIES OF ROCKET-BORNE PROBES USED IN MEASUREMENTS OF THE MIDDLE ATMOSPHERE
T.M. YORK, Penn. State University, Ionosphere Research Laboratory, *University Park, Pennsylvania* 16802 (ATM76-81004)

This grant funds a theoretical and laboratory study of rocket-borne ion mobility probes, to help understand the results obtained by these probes.

The three specific problems that will be addressed are: 1. Theoretical studies of electron collection by blunt probes. A new approximate theory has been developed for continuum collection but further detailed studies are needed to complete the analysis and perform comprehensive evaluation of probe data. 2. Theoretical studies of ion collection by a Gerdien condenser probe with an attached UV lamp. The creation, diffusion, and convection of ions from an axial beam must be studied to determine the details of the particle transport in this mobility spectrometer device. 3. Laboratory experimental studies of scaled probe flows. A new type of facility has been developed for testing scaled probes in laboratory flows. This study will consider collisional flows with blunt probes and the ion collection processes in the Gerdien with UV lamp device.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0034, THEORETICAL INVESTIGATION OF MAGNETOSPHERIC CONVECTION
R.A. WOLF, Rice University, Graduate School, *Houston, Texas* 77001 (ATM74-21185 A01)

The main thrust of this grant is the further development of a computer model of electric fields and plasma flow in the ionosphere and magnetosphere. It is now possible to model the time evolution of the magnetospheric plasma and electric-field distribution, self-consistently including partial ring currents in a plasma sheet with a realistic energy spectrum as well as horizontal ionospheric currents and Birkeland currents. The model will be improved by inclusion of the following physical processes: (1) neutral winds, (2) particle precipitation and charge exchange, and (3) time-dependent magnetic fields.

Using the model it will be possible to investigate the behavior of the closed field line region of the magnetosphere during substorms and the main phases of magnetic storms by doing computer simulations of observed specific events. In such a simulation, some of the available data will supply boundary conditions and initial conditions for the computer model. Other data will be used to test the ability of the computer model to predict geomagnetic and plasma effects. Emphasis will be placed on modelling events that occur during the International Magnetospheric Study (IMS) and are observed by several IMS satellites as well as the network of ground stations. A primary goal of the research will be quantitative understanding of the way in which particles are injected into the ring current from the plasma sheet.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0035, STUDY OF ELECTROMAGNETIC FIELDS AT HIGH ALTITUDE FROM THUNDERSTORMS AND ATMOSPHERIC CONDUCTIVITY
J.R. BENBROOK, Univ. of Houston, School of Arts & Sciences, *Houston, Texas* 77004 (ATM77-00910)

This grant will continue the support of a study of the effect of the conductivity of the atmosphere on the electromagnetic fields produced by thunderstorms and lightning at 30 to 35km altitude. A balloon payload, instrumented with double-probe electric field detectors, search coil magnetic field detectors and low-energy particle detectors, will be flown from the National Scientific Balloon Facility during the late spring of 1977. The data obtained will be analyzed for effects concerning the electrical connection between the lower atmosphere and the ionosphere.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0036, REMOTE SENSING OF SOIL MOISTURE
A.O. POULIN, U.S. Army, Remote Sensing Center, *Fort Belvoir, Virginia* 22060 (DA0N8005)

To investigate the effects of vegetation on the diurnal range of surface (radiometric) temperature for assessment of its effect on the remote observation of soil moisture.

Surface temperature, soil moisture and vegetation observations will be made at established test plots during growth and maturation of selected vegetation. Meteorlogical and radiometric observations will be made for correlation purposes.

ADDENDA: Supporting agency address is: OCE ETL Center for Remote Sensing RI, Ft Belvoir, VA 22060

SUPPORTED BY U.S. Dept. of Defense, Army

5.0037, SPECTRAL REFLECTANCE OF MINERALIZED AREAS
L.C. ROWAN, U.S. Dept. of The Interior, Geological Survey, *Herndon, Virginia* 22092 (9790-01696)

STATES TO WHICH PROJECT PERTAINS: Nevada, Utah, Colorado.

Plans include evaluation of existing in situ spectral reflectance measurements, correlation of mineralogic data with reflectance spectra to identify phases giving rise to significant features and preparation of a report concerning these results. Beginning in April, measurements and representative samples will be acquired for a broader range of alteration types than has been studied thus far. Aircraft flights are planned for the summer to acquire visible and near-infrared images of several key areas, including the East Tintic, Utah mining district, Battle Mountain, Nevada, Gold Acres, Nevada, and Goldfield, Nevada.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0038, OXIDATION-REDUCTION PROCESSES IN SYNTHETIC SILICATE MELTS
H.D. SCHREIBER, Virginia Military Institute, Undergraduate School, *Lexington, Virginia* 24451 (NSG 7355)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

5.0039, PHENOMENOLOGICAL STUDIES OF ATLANTIC CLOUD CLUSTERS
D.W. MARTIN, Univ. of Wisconsin, Space Science & Engr. Center, *Madison, Wisconsin* 53706 (ATM74-03466 A02)

The objective of this research continues to be to document the life cycle of several cloud clusters. This is to be accomplished through synthesis of satellite, ship, and aircraft observations collected during the Global Atmospheric Research Experiment (GARP) Atlantic Tropical Experiment (GATE). These observations will be examined and analyzed with the goal of defining the

time changing thermodynamic and dynamic structure and environment of the clusters. Similar analyses of several clusters that occurred during the Barbados Oceanographic and Meteorological Experiment (BOMEX) have been accomplished earlier in this grant. By means of this investigation, it is expected that a clearer understanding will be achieved of the mechanisms creating, driving, and destroying the clusters. Out of this work will come several case study models which will be compared with composite and numerical models.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

5.0040, STRATOSPHERIC AEROSOL AND GAS EXPERIMENT
T.J. PEPIN, Univ. of Wyoming, School of Arts & Sciences, *Laramie, Wyoming* 82071 (NAS 1-14931)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, AUDITORY AND VISUAL INFORMATION PROCESSING
S.R. PARKINSON, Arizona State University, School of Liberal Arts, *Tempe, Arizona* 85281 (DF223170; F33615-77-C-0053)

To investigate the information processing involved in instrument cross-check skills and task load stress.

An analysis of differences in visual scanning strategies employed by students and instructor pilots will be conducted. Visual scanning will be evaluated by both classical behavioral measures and film records of eye focus points. Task load problems will also be investigated. This research will be conducted in four phases: (1) The first phase will evaluate the effects of different amounts of exposure (using visual scanning tasks) on instrument displays measuring cross-checking capability. This phase should determine the amount of exposure which will result in maximum improvement in performance. (2) The second phase will examine critical features on instrument displays to see if presenting to trainees a variety of instrument displays early in training will facilitate more efficient critical feature analysis. The Ss will also be presented with novel aircraft displays to determine if this training procedure will enhance ability to learn efficient scanning strategies. (3) The third phase will employ a central light display with dynamic scanning requirements similar to those of the flight task. Response latency measures will be taken on both pilots and non-pilots to compare differences in use of the information obtained from the central light display. Response latencies for IPS and trainees on cued trials will also be compared.

ADDENDA: Supporting agency address is: AF Human Resources Laboratory FTT, Williams AFB, Arizona 85224

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0002, MECHANICS OF THE ORGAN OF CORTI
C.R. STEELE, Stanford University, School of Engineering, *Palo Alto, California* 94305 (R01 NS 12086-03)

The objective of this study is to understand the role of the mechanical (fluid-elastic) activity of the cochlea in processing acoustic signals. Of primary interest are the detailed mechanics of the organ of Corti, which may be involved in the 'second filter' between the gross basilar membrane response and the neural excitation. The alligator lizard papilla, for which the basilar 'membrane' provides no tuning, will be investigated in detail. With such results and the present results for recticular laminar flow, models for the mammalian organ will be reconsidered. For the gross basilar membrane response, a modification of the WKB method now enables calculation of fully three-dimensional flow of the cochlear fluid. Effects of cochlear curvature and end effects will be examined.

SUPPORTED BY U.S. Dept. of Health Education & Welfare, National Inst. of Health, National Inst. of Neurological & Communicative Dis. & Stroke

6.0003, VASOPRESSIN AND RENIN RELEASE
D.J. RAMSAY, Univ. of California, School of Medicine, *San Francisco, California* 94122 (NCA 2-665709)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

6.0004, ISD DECISION TRAINING ANALYSIS
A. LEAL, Perceptronics Incorporated, *Woodland Hills, California* 91364 (DN794004; N61339-77-C-0005)

This project is related to a current NavTraEquipCen 6.2 ISD program to establish the management and technical procedures for implementation of ISD in aviation training programs. The decision training requirements of the SH-2F (LAMPS) ASW helicopter will be determined, with special attention to the problems of tactical decision making within that system. The methodology to be developed will be generalizable to other systems.

An analysis of LAMPS operators' functions will be performed using existing task analysis data and instructional course material which is currently being developed. This information will be examined using a decision analytic technique based upon multi-attribute utility theory.

ADDENDA: Supporting agency address is: Naval Training Equipment Center, Orlando, FL 32813

SUPPORTED BY U.S. Dept. of Defense, Navy

6.0005, HORMONAL INFLUENCE ON ORTHOSTATIC TOLERANCE
D.S. GANN, Johns Hopkins University, School of Medicine, *Baltimore, Maryland* 21205 (NCA 2-355701)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

6.0006, BIOCHEMICAL CHARACTERIZATION OF A MICROORGANISM FROM A HIGH PH ENVIRONMENT
C. PONNAMPERUMA, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (NCA 2-420703)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

6.0007, DEFINITION OF SPACELAB I EXPERIMENT ON VESTIBULAR EXPERIMENTS
L.R. YOUNG, Mass. Inst. of Technology, School of Engineering, *Cambridge, Massachusetts* 02139 (NAS 9-15343)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

6.0008, QUANTIFICATION OF INFLIGHT FATIGUE
P.H. ABBRECHT, Univ. of Michigan, School of Medicine, *Ann Arbor, Michigan* 48104 (DF320310; F33615-76-C-0607)

This effort will provide a detection and assessment scheme for induced respiratory fatigue, and enable subsequent inference and prediction of systemic response. This latter provision will ensure a quantitative evaluation capability for environmental testing of life support items as well as contributing design guidelines for the same.

The contractor is required to derive a methodology for quantitating the phenomenon of fatigue with particular consideration of respiratory fatigue as it occurs in flight. Because fatigue is necessarily reported subjectively by the individual, objective physiologic measures must be accompanied by a subject reporting

scheme. The combination of physiologic measurements and sensation reporting will then be summarized in a form enabling accurate recognition and prediction of respiratory fatigue levels. This effort should be accomplished with the following sequence: (1) identification and evaluation of the most valuable noninvasive indicators of respiratory fatigue resulting from breathing resistances or their equivalent - in the laboratory setting inflight circumstances must be necessarily be approximated with treadmill exercise, ergometry, or equivalent, (2) development of an accurate method for subject reporting of fatigue on a timed interval basis, (3) determination of simple relationship between respiratory fatigue levels and easily measured functions such as spirometry, pneumotachography, or combined heart/lung function. Ultimately a recommendation is sought for the recognition of respiratory fatigue and its consequences via short-term noninvasive monitoring.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0009, VERIFICATION AND REFINEMENT OF PARAMETERS OF HUMAN OPERATOR MODELS FOR PILOT TRAINING MEASUREMENTS

N. CHAO, City University of New York, Undergraduate School, *Flushing, New York* 11360 (DF048910; AF-AFOSR-3350-77)

AF function - pilot training effectiveness measures are a necessary aspect of assessing the effectiveness of pilot training programs. Deficiency - improved models of pilot performance are needed to obtain more useful parameters for pilot training measurement. Objective - this work effort is designed to modify and improve an operator model that may improve current measures of pilot training performance. How research contributes - verification of an improved operator model will enhance the goal of establishing pilot training effectiveness measurement criteria throughout the entire course of pilot training.

The results will assess the promise of a new time domain model for determining pilot training as compared to existing models. The range or trend of various parameters as a function of pilot skill or training will be determined. The main feature of the new time domain model is the averaging aspect of the human operator, where an output value is not simply based upon a single value input delayed by some time.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NL Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0010, MICROBIAL ADAPTATION IN EXTREME ENVIRONMENTS - ANTARCTIC YEASTS

H.S. VISHNIAC, Univ. of Rochester, School of Arts & Sciences, *Rochester, New York* 14627 (NSG 7366)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

6.0011, CARDIOVASCULAR, RENAL & RESPIRATORY EFFECTS OF HIGH-INTENSITY, INTERMEDIATE-DURATION, LOW-FREQUENCY VIBRATION

R.M. NEREM, Ohio State University, School of Engineering, *Columbus, Ohio* 43212 (DF049720; AF-AFOSR-3411-77)

AF function - Air Force operational personnel are subjected to a number of environmental stresses, one of which is vibration. With increasing numbers of missions in high-performance aircraft at low altitudes, crew members will be exposed to increased quantities and durations of low-frequency vibrations. Deficiency - the circulatory system is one of the mammalian systems most affected by vibration - of particular interest is the influence of vibration on the transport of certain blood elements to and across the vessel walls and the effects on renal function. For example, if cholesterol transport to the arterial wall is enhanced and/or if renal function is impaired this would have significant implications on long-term health problems of exposed personnel. Objective - this effort will investigate the interaction between the physiological and fluid mechanical phenomena associated with whole-body sinusoidal vibrations. How research contributes - this research supports objectives identified in AFSC RO 1.6, 'Aircrew Safety and Effectiveness in Mechanical Force Environments', and RO 1.7, 'Aerospace Medicine'.

Vibration studies will be continued and expanded to include investigations into permeability and wall history. In addition, studies will include pulsed ultrasonic Doppler measurements of aortic velocity in animals undergoing chronic vibration in an effort to couple any changes in hemodynamics with changes in wall permeability and observations of lipid deposition pattern.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NL Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0012, WORKLOAD ASSESSMENT METHODS

R.L. HANN, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321020)

The objective of this work unit is to develop prototype task batteries for assessing and predicting operator workload dictated by mission/system demands. The performance metrics produced will allow comparable quantitative measures of workload demands for a variety of crew member information processing functions essential to advanced aeronautical systems. A secondary objective is to insure that the task battery procedures, metrics, and hardware/software specifications are mutually compatible with the laboratory simulation environment as well as the development test and evaluation (DT&E)/operational test and evaluation (OT&E) environments. This effort supports AFSC development goals TC-1, TC-2, TC-7, C3-3, RI-1, and MS-4.

Selected tasks from advanced digital information processing systems currently in conceptual or advanced development stages including DAIS, JTIDS, SDM, WMMCS, etc., will be analyzed in terms of man/computer information processing requirements. Critical problems will be identified from requirements and defined in terms of man/computer interface design for maximizing information transfer and throughput rates as determined from anticipated mission data rates. Human information processing measures and stages based on recent performance-theory developments will be analytically mapped onto the system data processing requirements. The results will be tested through experimental operator-in-the-loop part-task and mission segment simulations on the HESS. The resultant data and transfer functions will be integrated into the design of prototype task batteries for assessing workload as a function of task/equipment design and mission/system demands.

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0013, NOISE DOSIMETRY AND TYPICAL NOISE DOSES

D.L. JOHNSON, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF321280)

Various personal noise dosimeters are available on the commercial market; however, no systematic study of their merit and shortcomings has been accomplished. At the present time the AF does not use noise dosimetry to assess personnel noise exposure. It is essential to evaluate this technical concept to determine if it has a place in the AF hearing conservation program to recommend what the role of noise dosimetry should be. The objectives are to evaluate the application of personal noise dosimetry in Air Force environments, to determine the typical noise exposure of Air Force personnel in order to define typical occupational and non-occupational noise exposures, and to assess typical noise exposures relative to allowable exposures as specified in AFR 161-35. This work will be coordinated with the USAF Surgeon General and with base-level bioenvironmental engineers as well as the US EPA which will provide joint funding on the effort.

The approach will involve the use of personal noise dosimetry by Air Force personnel at various bases, with different AFSCS during both on-duty and off-duty hours. The selection of participants will insure that various degrees of noise exposure will be investigated. The noise exposures measured by the dosimeters will be compared to exposures described by the predictive methods now in use. Results will be used to verify the predictive

methods now in use, to determine the role of personal dosimetry in the AF and to determine the reasonableness of the safe 24-hour noise exposure limits currently identified by the EPA.

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch Lab BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0014, BASIC VISUAL PERCEPTUAL PROCESSES FOR DISPLAYS

W.L. MARTIN, U.S. Air Force, Aerospace Medical Res. Lab., *Dayton, Ohio* 45433 (DF322970)

To develop basic laboratory data related to the suprathreshold perception of simple waveform targets in the visual periphery. To develop the fundamental data required to adequately model visual system functioning for the off-axis detection of simple targets varying in both the spatial and temporal domain. To develop spatiotemporal contrast sensitivity functions at various locations in the visual field to allow definition of optimal stimulus parameters for those locations.

Initial FY 77 studies will be conducted using facilities already constructed for support of the windscreen evaluation program (work unit 71841803). These facilities will permit eccentric viewing of a video monitor up to plus or minus 90 degrees from the foveal along the horizontal, vertical, as well as oblique meridians, with complete control of contrast and spatial and temporal frequencies. FY 78 studies will require fabrication of a special-purpose electronic signal generator to provide control over target position, size, spatial frequency content, luminance and contrast characteristics, independent from the background parameters which will be similarly controlled. Target-to-background contrast required for alternative levels of probability of detection and time to detection for on-axis as well as various off-axis viewing angles will be defined. These data are crucial for development and testing of multiple-channel hypotheses of visual system functioning for both foveal and peripheral viewing. This basic research directly supports exploratory development efforts documented under work units 71840450, 'Cognitive Aspects of Visual Performance,' and 71840451, 'Quantification of Visual Performance.'

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch Lab HE, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0015, M&O IN SPT OF RESEARCH ON TRACKING PERFORMANCE IN MOIFE

G.T. COLLINS, Univ. of Dayton, Res. Inst., *Dayton, Ohio* 45409 (DF322520; F33615-76-C-0401)

Effects of chronic and acute exposure of humans to vibration stress are not sufficiently well understood to permit optimal weapon system design. The primary goal of this effort is continued safe operation of the Branch's motion simulators in support of in-house research. Emphasis on in-house control of experiments with human subjects dictates that protocols and interpretation of reduced data be controlled by Air Force personnel. Additional research is therefore aimed at obtaining support in carrying out approved protocols, obtaining data, and improvement or modification of simulators to give special environmental simulation.

The contractor will (1) establish and/or maintain safe operational procedures for all branch motion simulators and power supplies in operational status, (2) provide continuing operational and engineering support for said simulators and power supplies, (3) provide research into special instrumentation required for experiments carried out on said simulators, (4) provide data collection, reduction and analysis support for experiments carried out on said simulators, (5) provide research required to modify said simulators, their power supplies or their control systems when special environmental simulation is foreseen, (6) provide orientation in operation and maintenance of Branch motion simulators to otherwise qualified newly assigned in-house personnel. This work unit represents that 50 percent of Contract F33615-76-C-0401 which will be devoted to 'Support of Research on Tracking Performance in Multiaxis Oscillating Inertial Force Environment (MOIFE).' The other 50 percent of the contract is documented under 72310170, 'Support of Research on Visual Performance in Multiaxis Oscillating Inertial Force Environments (MOIFE).'

ADDENDA: Supporting agency address is: 6570 Aerospace Medical Rsch Lab BB, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0016, ELECTROPHORETIC SEPARATOR EXPERIMENTS

G.V. SEAMAN, Oregon State Higher Educ. Sys., School of Medicine, *Portland, Oregon* 97201 (NAS 8-32609)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

6.0017, PILOT PERCEPTION AND PERFORMANCE MEASUREMENT

P.R. KRISHNAIAH, Univ. of Pittsburgh, Graduate School, *Pittsburgh, Pennsylvania* 15213 (DF140650; AF-AFOSR-3239-77)

Part of AFFDL's responsibility is the development of advanced flight control systems and crew stations. The use of electrooptical, multi-function controls and displays in advanced crew stations places many new demands upon the pilot's visual and information processing channels. In addition, in order to compare candidate flight control systems and crew station components, simulations and flight tests are conducted in which pilot performance is measured. However, there is no single measure of pilot performance, thus requiring the collection of many kinds of performance data and their analysis by means of multivariate statistical techniques. The objective of this work effort is twofold: (1) to examine visual information processing techniques employing fast Fourier transforms, and (2) to evaluate available multivariate statistical techniques for simultaneous comparison of mean vectors and the development of computer programs to implement these techniques. Objective 1 will result in optimized symbol formats for electrooptical displays in advanced crew stations. Objective 2 will provide a means of determining which of the candidate crew stations/flight control systems is best for the pilot.

Objective 1: automatic pattern recognition techniques will be employed to evaluate symbol confusability both within and between symbol sets. Objective 2: seven currently available multivariate statistical techniques will be evaluated by the contractor as to their robustness to violations of the assumptions of homogenity of the population covariance matrix and the normality of the multivariate distribution. The most robust technique will be implemented by means of computer programs which will be available for use by AFFDL personnel.

ADDENDA: Supporting agency address is: AF Flight Dynamics Laboratory FGR, Wright-Patterson AFB, Ohio 45433

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0018, NUCLEAR SURVIVABILITY OF AIRCREW - LOW-DOSE EXPOSURES

D.J. BARNES, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF323360)

The objectives of this project are to gain data to be used as relevant input parameters to models designed to predict the effects of irradiation upon human performance. Utilizing primates trained to perform tasks analogous to those accomplished by human operators of the B-1, radiation effects on performance can be determined and subsequently extrapolated to gain probabilities of mission success.

This work unit is the second phase of a 2-part experimental procedure designed to determine the most probable effects of ionizing radiation upon aircrew performance. Six trained primates performing simultaneously on each of two tasks will be irradiated and pre- and post-irradiation performance measures taken. The decrement recorded in tracking, discrete avoidance, and reaction-time data will be utilized as input data to modeling efforts by USAFSAM and other DoD agencies.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine RZ, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0019, USAF HEARING CONSERVATION PROGRAM
D.C. GASAWAY, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322030)

Many USAF weapon systems and support operations represent potential risk to the hearing of both military and civilian personnel. Loss of highly trained personnel and compensation for hearing loss continue to be major Air Force problems. The primary objective of this effort is to monitor the USAF hearing conservation program, specifically as defined in AFR 161-35, 'Hazardous Noise Exposure', 29 July 1973. The prevention of noise-induced hearing loss among AF members, both military and civilian, requires that these personnel be included in a comprehensive hearing conservation program and the purpose of this research is to guarantee that the multifarious elements of the program are effective. In addition, research will be performed to validate auditory risk limits, determine the effectiveness of personal ear protection devices and noise control measures, and insure adequacy of criteria and procedures for disposition of noise-exposed personnel who demonstrate shifts in hearing.

Air Force forms 1490 and 1491 and associated documents received at the USAF Hearing Conservation Data Registry will receive quality control and then be processed by automated techniques. Computer readouts on a routine basis will be used to continually appraise and evaluate the effectiveness of the overall hearing conservation program. The effectiveness of different elements (military or civilian) at a single base will be continually appraised. Instrumentation utilized in monitoring audiometry, personal ear protection, and disposition procedures for personnel who demonstrate shifts will be assessed on a continuing basis. Methods and techniques used to monitor individuals exposed to potentially hazardous noise will also be continually evaluated and deficiencies, once identified, will be carefully studied so that corrective action(s) can be recommended. Auditory acuity of various groups and subgroups of personnel who work in noise will be studied. Recommendations for correction of problem areas will be made to command surgeons and HQ USAF/SGP, as appropriate. This work was formerly documented under work unit 7755-08-02.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0020, DEVELOPMENT OF DIAGNOSTIC CRITERIA FOR SIGNIFICANT HYPERTENSION IN AIRCREW MEMBERS
D. HULL, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF321840)

Uncontrolled hypertensive cardiovascular disease can lead to sudden incapacitation and its treatment has the potential of obviating performance of flying duties. This effort will define criteria for diagnosing true hypertension in contrast to labile blood pressure elevations where drug therapy is indicated, and the adequacy of blood pressure control while on waiverable medications.

Correlate the blood pressure responses during routine activities, orthostasis, and exercise in hypertensive and normotensive aircrew members. The presence or absence of cardiac involvement will be assessed via vectocardiography and echocardiography and will be correlated with the blood pressure responses to various stresses in normotensive, hypertensive (with and without drug therapy), and labile hypertensive aircrew members. This work was formerly documented under work unit 7755-01-05.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0021, AVIATOR'S BREATHING OXYGEN CONTAMINANT ANALYZER
K.G. IKELS, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322290)

Headquarters, Air Training Command, issued required operational capability Nr. ATC 2-72 in June 1972 for a portable oxygen contaminant analyzer. This ROC is for an immediate analysis capability for oxygen samples taken from aircraft following an inflight physiological incident where aviator's breathing oxygen is implicated. The ATC ROC was validated by HQ USAF on PMD Nr. R-Q-3-013-(1), dated 21 July 1972. The objective of this effort is to develop a portable contaminant detector for base-level personnel to perform oxygen analysis in accordance with use limits specified in T. O. 42B6-1-1.

Feasibility of a miniaturized portable infrared analyzer for field detection of use limit contaminants was demonstrated in OT&E program conducted in FY 74. The instrument transitioned to engineering development in late FY 74 and is now managed by the ASD/AEL under endeavor AO258. Major effort in FY 76 was the design modification and systems procurement. Operational T&E will be conducted in FY 77 and initial inventory deployment in FY 78. Previous accomplishments in this work area are documented under work unit 71641601. This effort is being transferred to implement a new technology planning objective as directed by HQ Aerospace Medical Division.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0022, AMST TOXIC GAS STUDIES
R.C. LIGDAY, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322640)

This effort will determine chemical composition of the cabin breathing environment in the advanced medium short-takeoff-and-landing transport (AMST) during simulated open-door flight operating modes. This support was requested by the AFFTC Human Factors Group to quantitate engine backwash into the flight deck and cargo compartment in the in-flight flap-down configuration. This continuation of the effort documented under 7164-16-28 will implement the technical planning objective directed by HQ AMD.

Flight testing will be done at Edwards AFB on both the YC-15 and YC-14 aircraft. Continuous measurements will be made of the cabin concentration of carbon monoxide, oxides of nitrogen and exhaust hydrocarbons during open-door flight maneuvers.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0023, THERMAL EVALUATION OF ANTI-EXPOSURE EQUIPMENT
S.A. NUNNELEY, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF320170)

The goal is to optimize anti-exposure protection for USAF operations over cold water. ASD has requested realistic guidance which will allow operational units to select a clothing ensemble which causes minimal encumbrance consistent with reasonable safety standards. These will take the form of tables entered with water temperature and predicted maximal pick-up time.

A stepwise approach is necessary, as follows: (1) determination of air and water ClO values (performed at USARIEM per MOA), (2) preliminary guidance to field, (3) development of computer model for prediction of self-help and survival limits, (4) validation of same, and (5) revision of field guidance. All work is being coordinated with USN (NADC).

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0024, MISSION-CREW EMPLOYMENT PROCEDURES FOR RIVET JOINT
W.F. STORM, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF322190)

The primary goals of USAFSS rivet joint modernization are (1) to better interface with tactical command control communications (C3) elements by closing the tactical loop communication system and (2) to improve manpower utilization. Both goals are accomplished through use of automated, computerized search and acquisition systems. These new systems permit more airborne time for data analysis and intelligence production. They also require new modes of operation, new skills, and increased workloads for the mission crews. Baseline data are not available on

the ability of operators to manage the modernized, high-speed, console stations. The objective of this work unit is to determine the psychological and physiological stresses on the mission crew members due to environmental conditions and interaction with the new system.

This evaluation will employ the USAFSAM stress battery, relying on behavioral and physiological indices to determine operator/crew rest requirements and crew performance problems related to inflight environment and workload. The inflight evaluations will be performed during test flights in January-June 1977. This effort was previously documented under work unit 7930-09-11.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine VN, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

6.0025, EDG/ERG/DARK ADAPTOMETRY
T.J. TREDICI, U.S. Air Force, School of Aerospace Med., *San Antonio, Texas* 78235 (DF321690)

To provide comprehensive electrodiagnostics for night vision evaluation in USAF aircrew members referred to USAFSAM, to gain insight into the processes of night vision disorders through the use of electrophysiology, to advance understanding of basic visual mechanisms objectively with the use of electrical technology.

Application of current technology using using averaging computers, storage oscilloscopes, rf shielded rooms, and other equipment will be continued in evaluating visual physiology. Improved stimuli (integrating spheres) and recording devices (electrodes) will be utilized to advance the quality and scope of collected data. Research into underlying visual mechanisms and processes will be pursued. Efforts previously under work unit 7755-09-04.

ADDENDA: Supporting agency address is: USAF School of Aerospace Medicine NG, Brooks AFB, Texas 78235

SUPPORTED BY U.S. Dept. of Defense, Air Force

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, AERONAUTICAL RESEARCH, TECH AREA D - RESEARCH IN MATHEMATICS
I.C. STATLER, U.S. Army, Air Mobility Res. & Dev. Lab., *Moffett Field, California* 94035 (DA0C5004)

Conduct research in the application of mathematics to the numerical solution of transonic flow problems with particular emphasis on the rotary wing advancing blade unsteady three-dimensional flow to develop codes which can be utilized for rotor blade design. This research will be conducted in joint participation with the NASA/Ames Research Center to provide a technological base in the aerodynamics of rotary wing and other V/STOL aircraft. The objective is to expand the technologies in those areas which are most likely to impact improved operational and cost effectiveness, survivability and safety future of Army air mobile systems.

Rotary wing transonic codes are developed and tested on the simpler problems verified by available experimental data and exercised to determine the unique features of the rotary wing transonic flow problems. Results of these numerical experiments are utilized to determine the necessity of increasing the problem complexity to more fully represent the actual rotor flow problem. Earlier studies have indicated the importance of including the unsteady terms in the analysis and more recent theoretical and experimental results have defined the limitations of the two-dimensional analysis.

ADDENDA: Supporting agency address is: AVRADCOM Air Mobility R&D Lab, Ames Directorate, Ames Research Center, Moffett Field, CA 94035

SUPPORTED BY U.S. Dept. of Defense, Army

7.0002, GENERALIZED EIGENVALUE PROBLEM
G.H. GOLUB, Stanford University, School of Hum. & Sciences, *Palo Alto, California* 94305 (NSG 1443)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

7.0003, ASYMPTOTIC ANALYSIS OF STOCHASTIC DIFFERENTIAL EQUATIONS WITH APPLICATIONS TO MECHANICS, NETWORKS AND QUALITY CONTROL
Z. SCHUSS, Univ. of Delaware, Graduate School, *Newark, Delaware* 19711 (DF049210; AF-AFOSR-3372-77)

AF function - improve the reliability of aerospace vehicle structures. Opportunity - an analysis technique newly developed by the author promises results in AF relevant reliability problems. Objective - new insight into control of reliability in physical structures. How work contributes - by suggestive examples exhibiting and quantifying relevant non-intuitive effects.

Matched asymptotics are used to study small stochastic perturbation of deterministic problems involving multiple turning points and equilibria. Probability of passage from one equilibrium to another, position of inner 'boundary' layers occurring in 'resonance,' expected exit times or points, etc., are to be determined as appropriate for problems including quality control (loading explosives in shells), dynamic stability of structures involving nonconservative forces (flutter), electrical network stability under thermal noise, transport and diffusion processes.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NM Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

7.0004, DEVELOPMENT OF BOOLEAN CALCULUS AND ITS APPLICATION
M.A. TAPIA, Univ. of Miami, School of Engin. & Env. Design, *Miami, Florida* 33124 (NSG 1436)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

7.0005, RESEARCH INITIATION - A LANGUAGE FOR THE DESIGN OF INTERACTIVE INFORMATION SYSTEMS
P.A. BERNSTEIN, Harvard University, Graduate School, *Cambridge, Massachusetts* 02138 (ENG77-05720)

This research deals with the design of applications software which interfaces to a data base management system. Typical applications systems include data processing and information systems such as airline reservations. The goal is to synthesize recent work in data base management, artificial intelligence and programming languages into a structured approach to the design and implementation of small, interactive information systems. These features will be incorporated into a computer program and evaluated, via representative applications, for efficiency of compilation and generation of code.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

7.0006, ACCELERATING CONVERGENCE OF COLLOCATION METHODS
J.W. DANIEL, Univ. of Texas, School of Natural Sciences, *Austin, Texas* 78712 (NSG 1440)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

7.0007, OPTIMAL SURFACE DESCRIPTIONS FROM LIMITED DATA
H. FUCHS, Univ. of Texas, Graduate School, *Richardson, Texas* 75080 (MCS77-03905)

In many technical endeavors the surface of a three-dimensional solid must be reconstructed from limited data, either to enable comprehension of its overall structural characteristics, or to allow its automatic manipulation and analysis.

Past research has generated encouraging preliminary results for the class of situations in which the data are specified as a sequence of single contours, and a new algorithm which generates, from any sequence of contours, an optimum surface, according to a minimum-surface-area measure.

This research is attempting to generalize this approach to the large class of structures which contain a variable number of closed contours on each level. Methods of compressing the resulting surface description with minimum degradation to the structural definition are being explored. Such surface descriptions are increasingly used in computer-aided design, bio-medical research, numerical control, visual flight simulation, and topography.

SUPPORTED BY U.S. National Science Foundation, Div. of Mathematical & Computer Sciences

7.0008, DEVELOPMENT OF A MULTI-TARGET COMPILER WRITING SYSTEM
S. FEYOCK, Coll. of William & Mary, School of Arts & Sciences, *Williamsburg, Virginia* 23185 (NSG 1435)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

7.0009, SYSTEMS WITH SLOWLY VARYING COEFFICIENTS AND SMALL NONLINEARITIES
J. KEVORKIAN, Univ. of Washington, School of Engineering, *Seattle, Washington* 98105 (MCS77-04944)

J. Kevorkian will investigate the areas of resonance in weakly nonlinear systems with slowly varying coefficients and the theory of partial differential equations with small nonlinearities. The research to date in these areas has led to significant contributions involving solution procedures using the method of multiple scales. Specifically, he will study the problem of a system of coupled ordinary differential equations with slowly varying coefficients with the goal of clarifying resonance mechanisms and the solution structure as the system evolves through resonance. For the case of partial differential equations, he will first investigate certain basic problems which have emerged from previous work on nonlinear wave propagation. In addition extensions of methods developed for airfoil theory are to be applied to the case of compressible subsonic flows.

SUPPORTED BY U.S. National Science Foundation, Div. of Mathematical & Computer Sciences

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, EXPERIMENTAL AND THEORETICAL STUDIES OF LATTICE DYNAMICS
J.B. PAGE, Arizona State University, School of Liberal Arts, *Tempe, Arizona* 85281 (DMR77-06809)

Continuation of research supported by DMR 75-10414.

The research proposed consists of a number of experimental and theoretical projects in the following four areas: (1) High pressure Brillouin scattering studies of molecular crystals, particularly the disordered-partially ordered phase transitions in KCN and NaCN. (2) Correlation spectroscopy studies on biological systems, concentrating on diffusion of macromolecules, reorientation phenomena of lattice defects possessing electric and elastic dipoles, and elementary excitations in an analog of the Wigner crystals. (3) Theoretical studies of the anharmonic properties of very low frequency impurity-induced phonon resonances. The initial concern will be anharmonic effects on defect-host coupling and isotopic frequency shifts. Effects of temperature, applied stresses and applied electric fields will then be studied. An investigation of defect-induced ferroelectric phase transitions will also be made. (4) Impurity-induced resonance Raman scattering. The general theory of resonance Raman scattering from impurities having strongly phonon-broadened electronic absorption bands will be studied with respect to the validity of the Born-Oppenheimer and Condon approximations. Ab initio calculations of F center electron-phonon coupling coefficients will be carried out and used as a basis for calculating K band, L band and multiphonon contributions to the Raman spectra. Studies will also be made of resonance Raman scattering from systems having well-resolved vibronic structure in the optical absorption bands.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0002, HIGH-ENERGY PLASMAS
A.J. LICHTENBERG, Univ. of California, School of Engineering, *Berkeley, California* 94720 (ENG75-02709 A01)

The research program will cover the following four topics: A. Theory of the resonant modification and breakdown of adiabatic invariants with applications to plasma heating, plasma trapping and confinement. Multiple frequency electron cyclotron heating will be studied, to determine if the invariant, which presently limits single frequency heating, can be broken. B. Experimental study of high current, field emission diodes immersed in the high magnetic fields of a magnetic mirror compression device will be continued, with a view to understanding 'beamlet' formation in such diodes. C. Study of cold plasma stabilization of hot-electron plasmas. Previous work will be generalized to include a parametric study of different gases and comparison with existing theory. D. A thoretical and experimental study of stabilization of a low-temperature, multiple-mirror plasma will be continued, to compare and evaluate minimum-average B, line tying, and feedback methods. The object is to determine whether such stabilization techniques are effective for multiple-mirror plasmas. This is an amendment to research previously supported under NSF grant ENG-7502709.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

8.0003, SOME THEORETICAL STUDIES OF THE PROPERTIES OF CONDENSED MATTER
T. HOLSTEIN, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (DMR75-19544 A02)

Continuation of research previously supported under DMR75-19544.

Research in theoretical condensed-matter science will be carried out. Topics to be investigated include: (1) the calculation of small-polaron hopping rates in solids, (2) the investigation of the electron-phonon enhancement of the electron-diffusion thermopower in metals, (3) studies of the mechanism of energy transport in disordered systems, (4) the development of a theory to describe the anisotropic exchange interaction between rare-earth impurities in a simple metal, and (5) investigations of the structure and phase transitions of macromolecules, polymers and liquid crystals.

This is the third year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0004, THEORETICAL NUCLEAR PHYSICS
S.A. MOSZKOWSKI, Univ. of California, School of Letters & Science, *Los Angeles, California* 90024 (PHY76-19477 A01)

Research in theoretical nuclear physics initiated under NSF grant PHY7417681 A02 will be continued. Topics to be investigated include: Nuclear Effective Interactions (Moszkowski): The Skyrme interaction will be studied and applied to giant resonances and other features of nuclear excited states. The new effective interaction of Schiffer will be compared to more realistic ones. Neutron Stars (Moszkowski): Research will continue on the effects of meson condensation and of the possibility of abnormal matter at high density when the effects of scalar and vector mesons are included. Results will be applied to the interpretation of properties of pulsars and X-ray sources. Nuclear Reactions (Wong): Work will continue on the study of corrections of the Glauber approximation to intermediate-energy nucleon-nucleus scattering. Particular attention will be paid to Fermi motion and higher order wave-spreading effects. Realistic fits to elastic p-

alpha differential cross sections will be attempted. Calculations of elastic alphanalpha scattering using a resonating group formalism will be extended to intermediate energy. Nuclear Structure (Wong): The correlated pair model of ground-state properties for A equals 3 and 4 nuclei will be studied using simple forces initially. Construction and study of nuclear effective interactions and generalized Skyrme interactions will continue. Further studies of nuclear matter properties and Coulomb displacement energies are also planned.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0005, HIGH FIELD SUPERCONDUCTIVITY AND TRANSPORT IN ANISOTROPIC CONDUCTORS
Y.B. KIM, Univ. of Southern California, School of Letters Arts & Sci., *Los Angeles, California* 90007 (DMR76-17500 A01)

Research begun under NSF Grant No. DMR76-17500 will be continued and extended. An experimental investigation of loss mechanisms in high field superconductors will be undertaken. The origin of surface losses in Nb3Ge will be studied by measuring the flux entry fields and correlating them with metallurgical structures of the surface. Nb3Ge will be prepared by chemical vapor deposition and the surface will be treated by laser glazing to increase the smoothness.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0006, NONLINEAR MIXING SPECTROSCOPY OF CONDENSED MEDIA
M.D. LEVENSON, Univ. of Southern California, School of Letters Arts & Sci., *Los Angeles, California* 90007 (DMR77-11326)

The experimental investigations of the nonlinear optical properties of condensed matter previously supported by NSF grant DMR-7614881 will be further developed and extended in new directions. The three-frequency coherent Raman spectrometer will be upgraded and its unique capabilities exploited to extract the signatures characteristic of specific physical processes while rejecting the artifacts generally present in the coherent anti-Stokes (CARS) technique and the Raman-induced Kerr effect (RIKES) technique. Topics for detailed study include: resonance effects in the Raman and electronic contributions to the nonlinear susceptibility tensor; relaxation effects in inhomogeneously broadened one- and two-photon electronic transitions on the picosecond and sub-picosecond time scale; and spatial dispersion in the effective third-order nonlinear susceptibility tensors in crystals lacking a center of inversion symmetry and in other systems in the region of a phase transition.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0007, THEORETICAL STUDIES OF SCATTERING DYNAMICS AND INTERMOLECULAR FORCES
H.S. TAYLOR, Univ. of Southern California, School of Letters Arts & Sci., *Los Angeles, California* 90007 (CHE76-15656 A01)

Taylor plans to pursue a broad program of research in atomic and molecular physics and chemistry. Areas of interest include: (1) extensions of many-body theory to new problems concerning electron impact ionization, inelastic scattering and elastic scattering; (2) the use of many-body effective potentials in the calculation of intermolecular forces and in pseudopotentials for two electrons; (3) studies of molecular systems that dissociate to states of atoms or ions with very short lifetimes; and (4) development of a classical method for simulation of quantum atom molecule scattering problems. This work is a continuation of that currently supported by Foundation grant GP-30710X.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0008, TURBULENT HEATING OF PLASMAS
F.W. CRAWFORD, Stanford University, School of Engineering, *Palo Alto, California* 94305 (PHY76-11384 A01)

A novel magnetron (power level 1 GW, frequency 3 GHz, 1 kJ/pulse in one second) will be developed. The very high power microwave radiation will then be used to study plasma heating and turbulence. The heating process will be studied in detail experimentally with parallel theoretical work.

This work is a continuation of that currently supported under NSF grant number PHY76-11384.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0009, HIGH-RESOLUTION TRANSMISSION ELECTRON MICROSCOPE STUDIES OF SMALL METAL CRYSTALLITES AND SURFACES
G.M. POUND, Stanford University, School of Engineering, *Palo Alto, California* 94305 (NSG 2249)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

8.0010, THEORETICAL ASPECTS OF SUPERCONDUCTOR BEHAVIOR
E. SIMANEK, Univ. of California, School of Natural & Agric. Sc., *Riverside, California* 92502 (EY-76-S-03-0034 P.A. 233)

The objective of the proposed research is to study theoretically the properties of inhomogeneous superconducting films and aggregates of ultrafine metallic particles. In particular, the temperature dependence of the order parameter will be calculated from the model of random superconductor to interpret recent tunneling studies on aluminum films. Effects of Josephson coupling between metallic particles in aggregates will be included into calculations of nuclear spin-lattice relaxation.

RESULTS: Results on dynamical and static properties of inhomogeneous superconductors near Tc have been obtained using Gaussian and Hartree-like approximations in the Ginzburg-Landau model of random superconductor.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Basic Energy Sciences

8.0011, FUNDAMENTAL PROCESSES IN PLASMAS
J.H. MALMBERG, Univ. of California, Graduate School, *San Diego, California* 92037 (PHY77-20613)

The research will include both theory and experiment and emphasize problems in plasma physics for which very precise experimental tests of theory can be obtained. Most of the experiments will be done with an important new type of plasma--an unneutralized, magnetically confined electron gas. Such plasma can be made by simple methods and contained for minutes, with the effects of both classical and anomalous transport clearly observed. The first objective is to understand this transport in detail. A second objective is to increase the plasma confinement time until the electrons come to thermal equilibrium with each other. A third objective is to decrease the plasma temperature and increase the plasma density until electron-electron correlations become strong. One can speculate that if this development succeeds, the electron gas will liquify, and at very low temperature freeze into a crystal.

The research on the TWT experiment will also continue. The next objective for this work is to observe the 'explosive instability.' This class of instability has been predicted theoretically but has never been directly observed experimentally.

This work is a continuation of that currently supported under NSF grant number PHY73-05125A03.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0012, PROBLEMS IN THEORETICAL PHYSICS
R.F. SAWYER, Univ. of California, School of Letters & Science, *Santa Barbara, California* 93106 (PHY76-11448 A01)

Research will be carried out in two areas of particle physics: 1) In the area of high-energy hadron interactions work will continue on the problem of scattering and particle production at high energies studied by means of the Reggeon field theory. There will

also be study of the problem of particle production at intermediate energies in Reggeon field theory and in models which incorporate direct channel unitarity; and study of the problem of quark confinement in gauge field theories. 2) In the area of high-energy phenomena in nuclear matter there will be examination of some consequences, in high-energy particle-nucleus collisions, of existing models of the pion propagator in nuclear matter. The suggestion is that by analyzing pion production in the nuclear fragmentation region, one may be able to study rather specific properties of the dispersion relation for a pionic excitation in nuclear matter. Work is planned on the role, in the fragmentation process, of other possible high-energy collective excitations of nuclear matter.

This work is a continuation of that previously supported by Foundation grant PHY74-12678AO1.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0013, CRYOELECTRONICS

R.L. PETERSON, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Boulder, Colorado* 80302 (2750187)

PURPOSE: To develop new measurement techniques incorporating the major improvements afforded by superconductivity and other low-temperature phenomena, in response to the needs to the National Measurement System.

OBJECTIVES: To apply superconducting electronic methods to radically new approaches to measurements and fundamental standards in all of the following diverse areas: picosecond pulse metrology, microwave and infrared frequency synthesis, electromagnetic field measurements across the six decades of frequency from RF to the far infrared, DC current and voltage, and temperature measurements.

FY77 MILESTONES: 1. Improve the accuracy of measuring RF power at the 10 to the minus 15th power watt level to plus or minus 0.3 dB, Apr 1977. 2. Perform calculations on the pulsing and switching capabilities of a single Josephson junction in various circuits, Sep 1977. 3. Develop an NBS capability for producing lead alloy Josephson junctions with tunneling barriers formed by RF oxidation, Sep 1977.

ACCOMPLISHMENTS: 1. Completed studies of 300 GHz heterodyne radiometer with sensitivity and bandwidth improved by factor of 10. 2. Completed construction of a SQUID prototype RF power measuring system for levels down to 10 to the minus 15th power watts. 3. Completed three-year effort on development of a self-calibrated 30 MHz SQUID attenuation measurement system with a dynamic range greater than 50 dB and uncertainty of less than .003 dB.

BIBLIOGRAPHIC REFERENCE: R. E. Harris, 'Intrinsic Response Time of a Josephson Tunnel Junction,' Phys. Rev. B, Vol. 13, No. 9, 3818-21, (May 1976).

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

8.0014, CONSTRUCTION OF A THREE-WAVELENGTH ELECTROMAGNETIC DISTANCE-MEASURING SYSTEM

J. LEVINE, Univ. of Colorado, School of Arts & Sciences, *Boulder, Colorado* 80302 (NSG 7344)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

8.0015, THE ACOUSTIC EMISSION FROM CRYSTALLINE MATERIALS

S.H. CARPENTER, Univ. of Denver, School of Engineering, *Denver, Colorado* 80210 (DF049530; AF-AFOSR-3395-77)

AF function - aircraft structures subject to static and dynamic loads are vulnerable to the initiation and growth of defects (e.g., cracks) which may lead to structural failures. Opportunity - often the growth of these defects gives rise to acoustic emission which can be detected and analyzed to provide a nondestructive evaluation (NDE) of the severity of the defect growth. Objective - the objective of this research is to correlate the characteristics of the acoustic signal to the type and severity of the defect origin. How work contributes -acoustic emission is a particularly desirable (NDE) concept because the growing defect 'calls out' its location, and one does not have to search for the defect.

The characteristics (e.g., wave shape, frequency components, amplitudes, etc.) of the acoustic emission will be related to the structural and metallurgical properties of the material and to the effect of stress states acting on the defect. Verification that a particular source is responsible for a characteristic signal will be obtained from other independent measurements.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0016, DYNAMICS AND MAGNETICS OF SOLID HELIUM-3

J.R. SITES, Colorado State University, School of Science, *Fort Collins, Colorado* 80521 (DMR73-02623 A02)

The properties of low-temperature solid 3He are extremely important in a number of areas: the study of thermodynamics and ordering in a compressible magnetic system, understanding of quantum effects due to zero point motion, and the attainment of lower temperatures. Included in this program are: (1) completion of thermal transport studies in solid 3He; (2) use of the same apparatus to systematically study the effect of a magnetic field on the thermodynamic properties; (3) initiation, in collaboration with Brookhaven National Laboratory, of a series of measurements at the 3He ordering temperatures; (4) continuation of a modest effort in phenomenological theory, tightening the framework in which experimental results are interpreted; and (5) exploratory experiments on hydrogenic impurities in solid helium.

This work continues and extends the work carried out under NSF Grant DMR73-02623.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0017, SUPERCONDUCTING LAYERED COMPOUNDS

D.E. PROBER, Yale University, School of Science, *New Haven, Connecticut* 06520 (DMR76-09591)

This project involves a study of the superconducting properties of layered transition-metal dichalcogenides and their intercalation complexes, such as TaS2(pyridine)1/2 and TaS2(chromocene). The magnetic susceptibility and lower critical fields, upper critical fields, and transport properties will first be studied. Properties of individual oriented microcrystallites, with mass less than a microgram, will be studied to obtain data for the numerous compounds which are unavailable as large crystals, such as TaS2(octadecylamine). This will also allow investigation of samples much more perfect than previously studied. A specially designed superconducting quantum magnetometer will be used in these measurements. Subsequent experiments will explore effects due to Josephson tunneling between the 6 A thick metallic layers, and the possible use of such crystals as Josephson effect radiation detectors. These studies are designed to clarify the fundamental nature and dimensionality of the superconducting properties of layered compounds, and to provide an understanding of the microscopic mechanisms determining these properties.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0018, THERMAL PROPERTIES OF INTERCALATED GRAPHITE COMPOUNDS

D.G. ONN, Univ. of Delaware, School of Arts & Sciences, *Newark, Delaware* 19711 (DF049480; AF-AFOSR-3393-77)

AF function - airborne systems utilized for command, control, communications, reconnaissance and surveillance depend heavily upon interconnected electronic components. Opportunity - improved performance of these systems can be expected from the use of lighter materials such as intercalated graphite compounds for electrical conductors. Objective - the objective is to contribute to the understanding of the basic physical properties of intercalated graphite compounds. How work contributes - intercalated graphite compounds, weighing about one fourth of that of copper, have the potential of having conductivities greater than

that of copper. This work should contribute to the development of intercalated graphite compounds that could replace copper as the dominant electrical conductor for airborne systems.

A systematic understanding of the thermal properties of both donor-and acceptor-type intercalated graphite compounds will be obtained. The specific heat will be determined for well-characterized single-crystal samples of selected intercalated compounds of both donor and acceptor types over the temperature range 0.4K to 300K, providing information on the electronic density of states and on phonon properties as reflected in the debye temperature. In addition the thermal conductivity and the thermoelectric power will be determined for these materials.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0019, ATOMIC DATA FOR HIGHLY IONIZED SPECIES
J. SUGAR, U.S. Dept. of Commerce, Natl. Bureau of Standards, *Washington, District of Columbia* 20234 (2320112)

PURPOSE: To obtain atomic data and develop measurement techniques for applications such as CTR, laser research, and space astrophysics. Emphasis for diagnostics of impurity elements in high-temperature fusion plasmas (CTR).

OBJECTIVES: The objective is to obtain wavelengths, energy levels, and line identifications for selected atomic spectra in the group of five to forty-times ionized atoms of the metals Zr, Nb, Mo, Ta, W, Re, Pt, Au, Hg, and other elements in related ionization stages.

FY77 MILESTONES: a) Definite identification of resonance lines of 12 and 13-times ionized molybdenum, Dec. '76. b) Install laser and target chamber to generate highly ionized spectra, Feb. '77. c) Prepare data on 4-times ionized zirconium for publication, Sept. '77.

ACCOMPLISHMENTS: a) Published wavelenghts, energy levels, and ionization energies for two different ions of each of the 14 elements Yb through Bi. Ions of the elements Ta, W, Re, Pt, and Au, and Hg, all of CTR interest, were included (through 11 and 12-times ionized Hg). b) New wavelength and energy level data were obtained for Zr VII, Nb VIII, Mo IX (Mo ion 8) and Mo XIII and XIV (Mo ion 12 and Mo ion 13) were obtained.

BIBLIOGRAPHIC REFERENCES: V. Kaufman and J. Sugar, Resonance Transition Array of Yb IV, J. Opt. Soc. Am. 66, 439 (1976). V. Kaufman and J. Sugar, Wavelengths, Classifications and Ionization Energies in the Isoelectronic Sequences from Yb II and III through Bi XV and XVI, J. Opt. Soc. Am., (in press, 1976).

SUPPORTED BY U.S. Dept. of Commerce, National Bureau of Standards

8.0020, CONDENSED MATTER SCIENCE - NUCLEAR RESONANCE STUDIES AT HIGH PRESSURE AND LOW TEMPERATURE
T.A. SCOTT, State University of Fla. Sys., School of Arts & Sciences, *Gainesville, Florida* 32601 (DMR77-08658)

This established research program on condensed matter is being continued with a wide variety of experiments on solids and liquids at low temperature and high pressure. Nuclear magnetic and nuclear electric quadrupole resonance spectroscopy are used. Work is concentrated on relatively simple and important molecular systems, such as nitrogen, carbon monoxide, chlorine, hydrogen chloride, etc., with the objective of attaining an in-depth understanding of their intermolecular potentials and physical properties over an extended range of pressure, volume, and temperature. Specific areas under study include molecular and solid-state structure; phase transitions and their pressure-temperature phase stability boundaries; order-disorder processes; ferroelectricity; magnetic shielding anisotropy in solids; the Knight shift in metals; electric field gradients in anisotropic metals and nonmetallic materials; nuclear relaxation processes due to diffusion and other forms of molecular motion in solids, liquids, mixtures, and microemulsions; isotope effects and defect properties. Novel experiments on rare isotopes, including both stable and radioactive species, are planned. Pulsed quadrupole resonance techniques are being developed for observing the very broad lines often encountered in disordered systems, as are procedures for performing nuclear resonance experiments at pressures up to 70 kbar.

This is a continuation of research supported under DMR 75-20161. First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0021, PLASMA VORTEX STRUCTURES
D.R. WELLS, Univ. of Miami, School of Arts & Sciences, *Miami, Florida* 33124 (PHY77-07106)

A study of naturally occurring, self-ordering stable plasma structure will continue. These structures are investigated theoretically and experimentally. The theory is concerned with an application of a variational principle and the use of appropriate constraint integers which correspond to the physics of the experiment. The total 'free' energy of the plasma structures is varied subject to these constraints in order to find the most stable plasma configurations. The determination of appropriate and complete sets of constraints for various situations is of current interest. The resulting equations of motion for the plasma are compared to experimental results.

The particular plasma structures currently under investigation are generated by conical theta pinch guns. The resulting plasma vortex structures are guided to the center of a primary magnetic mirror. They are then compressed and amplified by adiabatic compression, utilizing a secondary magnetic mirror system. Various plasma diagnostics are used to determine plasma temperature before and after compression. Secondary compression by magnetic vacuum fields as high as 100,000 Gauss is currently under investigation.

This work is a continuation of that currently supported under NSF Grant Number PHY74-08237A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0022, GENERATION AND DETECTION OF MICROWAVE PHONONS IN SEMICONDUCTORS
J.A. DAVIS, Illinois Inst. of Technology, School of Liberal Arts, *Chicago, Illinois* 60616 (DMR76-24466)

The generation and detection of microwave phonons in a semiconductor such as InSb will be investigated. This will be done by monitoring the free carrier absorption of light at various laser wavelengths in the far infrared. The laser frequency will be varied in order to probe the amplification of acoustic flux at different phonon frequencies. This will enable us to investigate acoustoelectric interactions due to both deformation potential and piezoelectric coupling in a frequency region which has not been readily accessible otherwise. The theory of both linear and nonlinear acoustoelectric interactions will be extended into this region of high ultrasonic frequencies.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0023, REACTIONS AND TRANSPORT IN THIN SOLID FILMS BY THE COMBINED APPLICATION OF COMPLEMENTARY ANALYTICAL TECHNIQUES
C.A. EVANS, Univ. of Illinois, School of Engineering, *Urbana, Illinois* 61801 (CHE76-03694 A01)

Thin films play a dominant role in modern technology. In almost every application, those films must maintain their structural integrity. This is rarely the case, because thin films can react at relatively low temperatures. Drs. Evans, Mayer and Nicolet will study reactions and transport in thin solid films by the use of complementary analytical techniques such as backscattering spectrometry, Auger electron spectroscopy, secondary ion mass spectroscopy, and electron microscopy. Simultaneous access to these techniques is offered by the combined resources at the Materials Research Laboratory of the University of Illinois and at the California Institute of Technology. They will investigate (1) reactions of thin solid films with substrates, (2) solid-phase epitaxial growth of Si and other semiconductors, and (3) the influence of impurities and interfacial layers on these solid-phase processes. The specific experiments are selected on the bases of three

criteria: (a) The insight the experiment provides into the inner mechanisms of these solid-phase reactions. (b) The relevance to present-day and future thin-film and electronic materials technology. (c) The development and evaluation of analytical techniques for the characterization of thin solid films. The results of these investigations apply directly to a wide class of thin-film systems and therefore are of significance to areas such as semiconductor device technology, thin-film superconductors and solar energy converters.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0024, ELECTRONIC TUNNELING FROM METALS - QUASIPARTICLE INTERFERENCE EFFECTS
W.J. TOMASCH, Univ. of Notre Dame, School of Science, *Notre Dame, Indiana* 46556 (DMR76-16998 A01)

Research supported by DMR71-01811 will be continued. In tunneling from a relatively thick superconducting film, complete or partial reflection of the electrons results in interference of the electronic wave functions which produce standing wave patterns in the film. The tunneling characteristics reflect this interference in an oscillatory variation of V, as a function of I and in the derivative curves. The periodicity of the oscillations has been shown to be relatively simply related to the Fermi velocity (VF) in the metal. In practice, the interference structure is obtained by backing the thick film with a thin layer of another metal or superconductor. This effect will be used to study Al to (a) determine accurately VF for Al and (b) evaluate critically the predictions of Wolfram's theory for this phenomenon. Similar studies will also be carried out using Cd and Zn. Further, it has been shown that the electron interference phenomena can be interpreted to yield the frequency-dependent electron-phonon coupling gamma 2 F (omega). Work on this aspect will also be continued.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0025, SOLID-STATE STUDIES USING THE MOSSBAUER EFFECT
J.C. WALKER, Johns Hopkins University, School of Arts & Sciences, *Baltimore, Maryland* 21218 (DMR77-07127)

Mossbauer Effect experiments will be carried out to observe the microscopic behavior in a variety of magnetic materials. The effects of sample thickness on the magnetic properties of ultra-thin films will be examined. Epitaxially grown films of iron with thicknesses between 10 and 220A will be made with the critical temperature and the nature of the magnetic order to be measured using Mossbauer spectroscopy.

Some splat-cooled Fe40, Ni40, B20-type amorphous ferromagnets will be used to study the spin-wave behavior and the magnetic phase transition as well as the magnetostriction. Mossbauer measurements will be made using an rf sideband technique developed by Chien and Walker to measure the magnetostriction.

A study of iron-poor FePd alloys will be made in an attempt to establish a closer connection between the magnetic properties of disordered alloys and those of amorphous ferromagnets.

This is a continuation of research previously supported under DMR75-13354.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0026, RESEARCH ON TERRESTRIAL GENERAL RELATIVITY EFFECTS USING ATOMIC CLOCKS AND AIRCRAFT
C.O. ALLEY, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (DF048090; AF-AFOSR-3268-77)

AF function - the AF has the responsibility of providing highly accurate time and frequency standards for use in high-precision navigation systems such as the global positioning system. Deficiency -methods for correcting for gravitational potential effects on measured time rates have not been properly incorporated into advanced navigational systems. Objective - the objective of this program is to clarify the effects of gravitational potential upon measured time rates as predicted by general relativity. The specific areas to be investigated are (1) the effect of latitude on clock rates, (2) the effect of the gravitational potential of the sun on clock rates, and (3) an accurate measurement of the effect of earth rotation on time. Contribution - this research will contribute to the development of highly accurate navigational systems for aircraft and missile use.

The existence of commercially available cesium atomic clocks, which exhibit stabilities of 2 x 10 (-14) per day when their environment is suitably controlled, allows significant measurements to be made in a terrestrial environment of the general relativistic effects on time. Of major interest is an investigation of the rate of clocks placed at different latitudes. General relativity predicts that the change in velocity due to earth rotation in going from the equator to the pole is just compensated by the change in gravitational potential along the geoid. Comparison of clocks that have been at different latitudes (with proper correction for the effect of transporting them) will provide an interesting null experiment. Of next interest is an investigation of the rate of clocks at different latitudes on the earth as they are affected by the gravitational potential of the sun. At the time of the solstices, 22 December and 22 June, the axis is tilted 23.5 degrees away from or toward the sun, resulting in different average solar gravitational potentials at different latitudes. General relativity predicts that the clock-rate difference expected from the solar potential difference is cancelled by orbital velocity differences.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NP Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0027, SPECTRAL STUDIES RELATED TO DISSOCIATION OF HYDROGEN-BROMINE, HYDROGEN-CHLORIDE AND BROMINE-OXIDE
M.L. GINTER, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (NSG 7340)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

8.0028, NOISE AND PROPERTIES OF MATERIALS AT LOW TEMPERATURE FOR APPLICATION TO GRAVITY GRADIOMETRY
J. WEBER, Univ. of Maryland, School of Arts & Sciences, *College Park, Maryland* 20742 (DF048190; F49620-77-C-0065)

AF function - gravity gradiometers are being developed to conduct gravity surveys over unmapped ocean areas to determine more precisely the deflection of the vertical along missile flight paths. Deficiency -the missile CEP requirements for the period 1990 are such that the gravity gradiometers will have to have an accuracy of ten to the minus 12 g/m. Although the present technology of electronic components has reduced the thermal noise levels within the system to their equivalent Brownian motion, cryogenics techniques will have to be investigated to make any significant reduction in noise levels to meet the required specifications for future gravity gradiometers. Objective - this research will establish the procedures and cryogenic techniques required to operate future extremely sensitive instrumentation in a controlled environment. Contribution - inertial navigators are ultimately limited in accuracy by the determining of the local gravity field (deflection of vertical). Therefore, improved gravity gradiometers will provide the necessary data to determine the deflection of vertical during flight paths or operation.

Different materials will be selected to study the noise and attenuation factors at liquid nitrogen temperature (4.2 degrees Kelvin). These materials and cryogenic techniques will be investigated to determine their applications for use in gravity gradiometers. Material to be investigated will include aluminum, sapphire and niobium.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NP Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0029, PHOTOPRODUCTION OF PIONS FROM COMPLEX NUCLEI
E.C. BOOTH, Boston University, School of Liberal Arts, *Boston, Massachusetts* 02215 (PHY77-14903)

A program of meson photoproduction studies will be continued at the MIT Bates Electron Linear Accelerator, in collaboration with scientists from MIT and other institutions. (a) Coherent, threshold-region neutral pion production total cross sections will be measured to investigate the reaction mechanism and the interaction between the produced pion and the residual nucleus. (b) The photoproduction of charged and neutral pions and of protons will be studied with moderate energy resolution in the region of the 3-3 resonance. (c) The above studies will be extended, subject to detailed design and feasibility studies, to high-resolution studies of neutral photo pion angular distributions and to a study of the energy dependence of multiparticle production. This work is a continuation of that performed under Foundation grant PHY76-15850.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0030, PROPERTIES OF AMORPHOUS SEMICONDUCTORS
W. PAUL, Harvard University, School of Arts & Sciences, *Cambridge, Massachusetts* 02138 (DMR76-15325 A01)

The experimental program of studies in amorphous semiconductors which previously was supported by NSF grant DMR75-18477 will be continued. The general program covers the preparation, characterization and measurement of transport and optical properties with emphasis on the role of local defects and impurities.

The previous studies of the structural and electronic properties of amorphous germanium and silicon will be extended to the related amorphous III-V alloys with particular regard to the question of 'wrong bands.'

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0031, SUPERCONDUCTIVITY AND FAR-INFRARED STUDIES OF SOLIDS
M. TINKHAM, Harvard University, School of Arts & Sciences, *Cambridge, Massachusetts* 02138 (DMR76-11323 A01)

This extension of work carried out under grant DMR72-03060 from the N.S.F. is part of a broad program of research on superconductivity. The focus has shifted somewhat from fluctuation effects near Tc to the study of non-equilibrium superconductivity. Experiments are planned to probe the kinetics of the relaxation processes operative in the presence of various types of perturbations. For example, the step structure of I-V curves of superconducting microbridges has been explained by this group in terms of localized quantum phase-slip centers, in which the phase slip rate and hence the voltage is determined by the distance nonequilibrium quasiparticles diffuse before relaxing by phonon emission. Tunneling experiments are planned to give energy-resolved and spatially-resolved information about the disequilibrium near such a center to explore this fundamental resistive process in superconductors. Preliminary measurements of the effect of a magnetic field on these centers will be extended with the aim of exploring the transition from the present regime dominated by the electron-phonon relaxation time to one presumably dominated by the Ginzburg-Landau time, as would be expected for a gapless superconductor. Experiments in which the disequilibrium is produced by laser irradition will be undertaken. Far-infrared lasers can selectively generate excess quasiparticles just above the gap energy, to produce a relatively simple starting point for the study of relaxation processes. Experimental and theoretical investigations of the laser-induced resistive intermediate state will be carried out to learn whether in fact a spatially inhomogeneous state forms spontaneously even for uniform irradiation.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0032, NEUTRON SCATTERING STUDIES OF ORDERED AND DISORDERED MATERIALS
R.J. BIRGENEAU, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (DMR76-19839)

A comprehensive neutron scattering program using mainly the Brookhaven high-flux beam reactor will be carried out including experiments on prototypical systems designed to elucidate the basic physics in the areas of random crystalline materials.

These systems include Rb2MnxNi1-xF4, Rb2MnxMg1-xF4, and (CD3)4 NMn1-x CuxCl3, which correspond to site-randomized (2d) binary magnetic, binary dilute and (1d) binary magnetic archetypes of random behavior in dimensions less than three and as such should allow a direct confrontation between experiment and theory for disordered crystals. A full quasielastic and inelastic neutron scattering study of the dynamics and critical behavior of these materials is to be done.

Other systems to be studied by neutron scattering include rare-earth valence fluctuation materials such as SmS, TmSe and CexTh1-x, the perovskite catalysts, La1-xPbxMnO3 and amorphous ferromagnetic transition-metal alloys (Fe1-xNix).75P .16B .06A1 .03. In the valence fluctuation materials, the rare earth may reside in an intermediate valence state with temporal fluctuations between the bounding integral valence values. Associated with these fluctuations are dramatic electronic, and magnetic and, most probably, lattice vibrational effects. In this case, a detailed study of both the inelastic magnetic scattering and the lattice vibrations will be carried out.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0033, STUDIES OF SUPERCONDUCTING JUNCTIONS IN THE INFRARED AND VISIBLE REGION
A. JAVAN, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139

The response of small-area high-speed superconducting junctions has been studied at infrared and visible frequencies and compared to the microwave response. The use of these high-speed junctions as harmonic mixers in the visible region is presently being explored.

SUPPORTED BY Massachusetts Inst. of Technology

8.0034, SCATTERING SPECTROSCOPY OF LIQUID CRYSTALS
D.J. LITSTER, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (DMR76-18035)

Studies of the normal modes and phase changes in liquid crystals are underway. Experimental techniques include: (1) investigation of the spectrum, polarization, and intensity of light scattered by thermal fluctuations about the equilibrium state, and (2) investigation in the time domain of system response to pulses from a mode-locked dye laser, and (3) high-resolution X-ray scattering to examine the liquid crystal structure factor S(q). The initial effort is on smectic A phases, with later extension to smectic phases C, B, D etc. These experiments are expected to be significant for the intellectual development of condensed-matter physics with respect to examination of the scaling hypothesis, elucidation of phase changes, and testing of certain aspects of many-body theory.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0035, SUPERCONDUCTIVITY - EFFECTS OF STRESS AND PARAMAGNETIC IMPURITIES
H.H. SAMPLE, Tufts University, School of Arts & Sciences, *Medford, Massachusetts* 02155 (DMR74-23480 A01)

This research is a completion of work begun under NSF Grant 0DMR74-23480. Thermal conductivity, electrical conductivity, specific heat and the superconducting transition temperature will be measured for disordered and crystalline solids in order to study the electron-phonon interaction and the properties of the conduction electrons in these solids. A study will be made of the effects of strain on the superconducting properties of both

disordered and crystalline systems. Both hydrostatic and uniaxial stress techniques will be used. An effort will be made to study the effect of defects on the superconducting transition temperature.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0036, POSITRON ANNIHILATION MEASUREMENTS IN LOW-TEMPERATURE HELIUM

K. CANTER, Brandeis University, School of Arts & Sciences, *Waltham, Massachusetts* 02154 (DMR76-02041 A01)

An experimental program has been inititated to study positron interactions with liquid and gaseous helium. The major purpose of the experiments is to determine the nature of self-trapping of positronium and positrons in helium. In particular, the trapping of positrons in helium gas produces the striking effect of the positron annihilation rate suddenly undergoing a violent increase when the positron slows down to some low value of energy (less than 10 to the minus 2 power eV) in the gas. At these energies the positron de Broglie wavelength is comparable to the positron mean free path and several times the helium interatomic spacing. In this respect, the positron problem takes on important features common to the problem of electron conduction in amorphous electronic devices. Since all the features of low-energy positron-single helium atom collisions are understood, an investigation of helium provides a practically unique opportunity to investigate the role of the positron's wave mechanical behavior in a system of randomly distributed scattering centers.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0037, GENERAL RELATIVITY AND FIELD THEORY

S. DESER, Brandeis University, School of Arts & Sciences, *Waltham, Massachusetts* 02154 (PHY76-07299 A01)

Theoretical research initiated under NSF grant PHY74-17849A01 will be continued and expanded. Topics to be investigated lie in Quantum Gravity, Nonabelian Gauge Theories and Classical Relativity. The first, and major, problem is to reconcile the (observationally required) uniqueness of Einstein theory at low frequencies with its failure (nonrenormalizability) as a quantum field. The only present candidate is a combined Einstein-Weyl model, with higher order derivatives. One does not understand such theories well enough to be sure that their apparent 'ghost' content is unavoidable. More radical departures in which general relativity is an effective Lagrangian resulting from matter excitations will also be considered. Within the conventional framework, the effect of graviton radiative corrections on physical quantities such as form factors and a number of formal problems of covariant quantization (measure, Slavnon transformations) will be treated. In the second area, some specific problems are: the strong differences between abelian and nonabelian models with respect to duality transformations, field strength-potential relations and the role of the dual tensor. In classical theory, research will pursue the interaction of classical metric with quantized matter fields in terms of renormalizability of the latter and vacuum polarization by the classical metric. Understanding of these effects is essential in assessing reaction back on geometry (and matter) of the quantum properties of matter itself. Separately, the classical dynamics of the higher order models of gravity, i.e., the degrees of freedom, energy and propagation, must be understood if these models are to become viable quantum systems. Finally, the existence of localized stable solutions in classical relativity will be investigated.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0038, POSITRON INTERACTIONS WITH ATOMS AND MOLECULES

W.E. KAUPPILA, Wayne State University, School of Liberal Arts, *Detroit, Michigan* 48202 (PHY77-18760)

A low-energy and highly monochromatic positron beam has been developed and used to initiate a complementary program of research involving the collisions of positrons with atoms and molecules.

The present measurements will be continued with increasing emphasis being placed on investigations of possible structural features in total scattering cross sections, such as Ramsauer-Townsend effects, resonances, and behavior near inelastic thresholds. The program will also be expanded into new areas of positron research, including positron collisions with atomic hydrogen and alkali atoms, and differential scattering of positrons. Comparison measurements between positrons and electrons in the same apparatus are an important part of this research program.

This work is a continuation of that currently supported under NSF grant number PHY75-07165 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0039, RAMAN SCATTERING STUDIES OF ION-IMPLANTED SILICON CARBIDE AND P-TYPE SILICON CARBIDE

P.J. COLWELL, Michigan State University, School of Natural Sciences, *East Lansing, Michigan* 48824 (DMR76-81842)

The research supported by this grant will include vibrational Raman scattering studies of ion-implanted semiconductors to determine the lattice location of the implanted species, and to characterize the nature of the implantation-induced lattice damage. Initially, silicon carbide which has been bombarded with H ion, D ion, and He ion will be studied.

Also, electronic Raman scattering studies of either heavily or lightly doped p-type semiconductors will be performed, in order to obtain information about the valence bands, and, for lightly doped p-typed semiconductors, to study several unexplained features of acceptor Raman spectra. Initially boron- and aluminum-doped silicon carbide will be studied.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0040, SINGLE-PARTICLE AND PAIR-TUNNELING SPECTROSCOPY OF A15 SUPERCONDUCTORS

A.M. GOLDMAN, Univ. of Minnesota, School of Liberal Arts, *Minneapolis, Minnesota* 55455 (DMR76-01370 A01)

Single-particle tunneling experiments will be carried out on both A15 single crystals and A15 films in an effort to obtain quantitative data which can be used to test microscopic theories. In addition the pair-field susceptibility of A15 single crystals will be studied. From this investigation, which involves the study of a precursor of pair tunneling, the spectrum of order parameter fluctuations will be obtained, opening up the possibility of ascertaining whether the superconductivity of the A15 compounds is quasi-one-dimensional as is implied by some of the models. It is also planned to carry out both the single-particle and pair-tunneling experiments on single crystals in the vicinity of the structural transition temperature in materials where this is technically possible. These investigations may reveal the relationship between the structural and superconducting transitions in A15 superconductors. To control the nature of the samples used in these investigations chemical analysis of both the insulating barrier of a junction and of the superconducting materials adjacent to the barrier will be carried out with a thin-film analyzer which combines Auger electron spectroscopy (AES) and ion sputter-etching.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0041, ANALYTIC AND AXIOMATIC METHODS IN RENORMALIZATION THEORY

E.R. SPEER, Rutgers The State University, Graduate School, *New Brunswick, New Jersey* 08903 (PHY77-02277)

Work will be done on several problems in the application of dimensional renormalization to the perturbation series in quantum field theory: the development of a systematic formalism for discussing anomalies, the calculation of effects particular to a given dimension, the study of theories with both massless and massive particles, and the definition of distributions in complex dimension.

This work is a continuation of that currently supported by Foundation grant PHY74-05783A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0042, MAGNETIC RESONANCE, OPTICAL, AND ELECTRON SCATTERING SPECTROMETRY OF SOLIDS
T.R. CARVER, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (DMR76-18667 A01)

Research on the electronic and magnetic properties of condensed matter previously supported by NSF grant DMR-7618667 will be continued. Work in magnetic resonance will include studies of the critical exponent beta in several magnetic metals by a new method involving zero applied field. This method involves measurement of the temperature swept magnetic resonance transmission which has been successfully tried in nickel. Also, experiments on low-frequency conduction electron resonance in aluminum will be continued. New work will be initiated concerned with the development of new methods for measuring the magnetization and susceptibility of spin glass at low applied fields and for measuring critical exponents by alternative methods.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0043, ELECTRONIC SPECTROSCOPY
D.S. MCCLURE, Princeton University, Graduate School, *Princeton, New Jersey* 08540 (CHE76-18432 A01)

Dr. McClure will continue research (currently supported by NSF Grant, CHE-7103277) in the following areas: A. Development of methods of modulation spectroscopy for the vacuum ultraviolet spectral region and their application to the study of impurity levels in ionic crystals. Further, the quantum-theoretical analysis of impurity levels is being considered. B. Photoionization measurements of impurities in ionic crystals. C. Work with synchrotron radiation is planned. D. Primary photochemical processes of several specific types will be examined using the dye-laser methods. E. Fluorescence excitation experiments will be carried out using a dye laser.

SUPPORTED BY U.S. National Science Foundation, Div. of Chemistry

8.0044, MAGNETIC RESONANCE PROPERTIES OF IONS IN LIQUID AND SOLID HELIUM
J.F. REICHERT, State University of New York, School of Natural Sci. & Math., *Buffalo, New York* 14214 (DMR76-10135 A01)

In work carried out under NSF grant number DMR73-07673 A02 anomalous enhancement of the ESR signal with decreasing pressure was observed in liquid helium into which ions had been injected by field emission. The present work aims at explaining these effects by (1) repeating the experiments using field emission from tips of different materials, (2) repeating the experiments using thermionic emission rather than field emission and (3) studying both the intensity and spatial distribution of visible light emitted from the region around the tip. Experiments are also planned to study the diffusion of ions in solid He3 to determine the mechanism by means of ESR. Also systems of ions in liquid neon will be studied by ESR to shed light on the nature of these ions and the surrounding neon.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0045, MATHEMATICAL ASPECTS OF QUANTUM FIELDS AND STATISTICAL MECHANICS
J. GLIMM, Rockefeller University, Graduate School, *New York, New York* 10021 (PHY76-17191 A01)

One will study the critical region in quantum field theory and statistical mechanics by use of correlation inequalities, scaling and/or analyticity methods. In the high- and low-temperature regions, one also has cluster expansion methods, and can investigate particle structure and completeness.

This continues research previously funded under PHY74-13252 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0046, QUANTUM TOPOLOGY
D. FINKELSTEIN, Yeshiva University, School of Science, *New York, New York* 10033 (PHY76-04872 A01)

A program of quantum topology will be followed. Its exploratory phase (1953-1969) resulted in discoveries and publications of the kink, a black hole, a unified electromagnetic-weak theory, and other physical theories not yet further developed. Its development phase, now close to an end, consists in the construction of a finite covariant quantum language useful for particle physics, called polyadics. These concepts will be further developed and applied.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0047, GROWTH, CHARACTERIZATION AND ANALYSIS OF NARROW BAND-GAP INFRARED DETECTING MATERIALS
P.M. RACCAH, Yeshiva University, Graduate School, *New York, New York* 10033 (DF039430; AF-AFOSR-2714-74)

AF function - infrared detectors are essential solid-state components of Air Force reconnaissance and surveillance systems. Opportunity - presently, infrared materials are sufficiently understood to produce detectors with predictable responses. The development of improved infrared detectors requires a full understanding of the role defects, impurities and nonstoichiometry play in the detection process and their optimum performance in detector arrays. Objective - to characterize and understand the lattice response and detection properties of synthesized and specially doped narrow-band-gap compound semiconductors such as (Hg, Cd) Te systems having optimum detectivities in the spectral range of 10 to 20 microns. How work contributes - high-density infrared detector arrays could result from this new approach to crystal growth, characterization and understanding of the electronic structure and optical properties of narrow-band-gap semiconducting compounds.

Characterization of electronic structure and optical properties is accomplished nondestructively by a unique wavelength modulated photoresponse and by electroreflectance spectroscopy to analyze impurity centers and to recognize actual changes in composition across the surface of a wafer with a spatial resolution commensurate with the dimensions of the detector array. A new approach to the growth of highly uniform, large (Hg, Cd) Te crystals involves the application of peltier-induced liquid-phase epitaxy.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0048, THE DEVELOPMENT OF FERROMAGNETIC SPINELS FOR OPTICAL ISOLATION AT 10.6 MICRONS
K.J. TEEGARDEN, Univ. of Rochester, School of Engin. & Appl. Sci., *Rochester, New York* 14627 (EY-76-C-02-4056)

A continuation of the development of ferro and ferrimagnetic semiconductors for optical isolation at 10.6 microns is proposed. Measurements of specific Faraday rotation, passive extinction coefficient and forward-to-back extinction ratio will be made on forged blanks of CdCr2S4. Laser-induced damage tests using a TEMoo CO2 laser will be conducted and correlated with fabrication procedures. Blanks of CoCr2S4 will be forged and subjected to the same tests. Evaluation of oxide spinels, CoFe2S4 and FeCr2S4 will be made to determine their suitability as room-temperature isolator materials. In all cases the absorption coefficient, alpha, will be monitored at 10.6 microns and correlated with fabrication procedures.

RESULTS: During the period August 1, 1976 to April 30, 1977 small single crystals of CdCr2S4 and CoCr2S4 were grown. This absorption coefficient, alpha, of CdCr2S4 crystals was measured at 10.6 microns and correlated with growth parameters. The best result to date was alpha equals 15.5 cm to the minus 1st power. An analysis of the intrinsic absorption of CdCr2S4 at 10.4 microns indicate a lower limit to alpha of 10 to the minus 4th power cm to the minus 1st power. Measurements of alpha vs. lambda in hot pressed disks of CdCr2S4 reveal that the most probable impurity affecting alpha at 10.6 microns is SO4. Equipment and facilities for preparing materials in an oxygen-free en-

vironment are being constructed. A TEMoo pulsed CO2 laser for damage tests has been purchased and is being set up.

SUPPORTED BY U.S. Energy Research & Development Admin., Div. of Laser Fusion

8.0049, HIGH-TEMPERATURE PLASTIC FLOW IN A15 SUPERCONDUCTING COMPOUNDS

R.N. WRIGHT, Rensselaer Polytechnic Inst., School of Engineering, *Troy, New York* 12181 (DMR76-00554)

This is a fundamental study of the high-temperature deformation characteristics of Hb3Sn. Such a study is needed to assess the direct role of hot deformation processing as a fabrication expedient for the high-volume production of A15 conductors. Bulk samples of Hb3Sn are prepared by hot isostatic pressing to achieve maximum density. After microchemical and structural characterization, the specimens are deformed in tension varying temperature, stress and strain rates. The objectives of this investigation include: (1) the development of a quantitative description of the influence of temperature on the ductility of Nb3Sn; (2) the development of a quantitative description of the flow stress-temperature - strain rate interrelationships in the plastic flow regime; and (3) the identification of the dominant deformation mechanisms and the preparation of a deformation-mechanism 'map'.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0050, OPTICAL BIREFRINGENCE STUDIES OF LATTICE DEFECTS

J.W. MATTHEWS, Internat. Bus. Machines Corp., *Yorktown Heights, New York* 10598 (DF047790; F49620-77-C-0060)

AF function - solid-state microwave devices are essential components of Air Force command and control, communications and surveillance systems. Deficiency - methods for non-destructive testing of microwave materials are inadequate. Objective - it is the objective of this research to develop methods to evaluate non-destructively bulk and epitaxial microwave materials. How work contributes - this research should provide methods to evaluate large crystals before the costly steps of sectioning them into wafers and polishing the wafers are begun and to evaluate electronic devices after each step during processing.

Birefringence techniques will be developed to determine the location and range of dislocations and to study their origin in bulk and epitaxial microwave materials.

ADDENDA: Supporting agency address is: AF Office of Scientific Research NE Bldg 410, Bolling AFB, DC 20332

SUPPORTED BY U.S. Dept. of Defense, Air Force

8.0051, SPACE CHARGE AND ELECTRODE REACTION EFFECTS IN SOLIDS AND LIQUIDS

J.R. MACDONALD, Univ. of North Carolina, School of Arts & Sciences, *Chapel Hill, North Carolina* 27514 (DMR76-84187)

This work is concerned with the electrical behavior of systems in which a nonmetallic solid or liquid is in contact with metal electrodes. Greater understanding of such systems is desirable both for its intrinsic scientific value and for its technological applications, notably in the area of energy conversion and storage. The primary goal is to relate electrical responses observable in the laboratory (transient and steady-state ac and dc response) to the parameters which characterize the behavior of the system on a microscopic level.

The research includes the following: The exact small signal ac response is being determined for a somewhat more general microscopic model than treated previously, representing a wider variety of systems. The exact response will be cast into simplified forms for easier comparison with experiment. The transient and steady-state ac and dc response of a selected group of systems will be determined by computer simulation. Modifications will be made in the basic microscopic equations to better represent materials, such as superionic conductors, in which the motions of individual mobile charges are strongly coupled with each other.

Continuation of work supported under DMR-75-10739. Three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0052, THEORETICAL STUDIES ON VARIOUS COMPOSITE PARTICLE SYSTEMS

L.L. FOLDY, Case Western Reserve Univ., School of Science, *Cleveland, Ohio* 44106 (PHY76-00299 A01)

Theoretical research on composite particle systems will be initiated. Particular topics to be investigated include: 1. Relativistic particle theories with direct interactions; 2. Multiple scattering theory; 3. Coulomb lattices; 4. Miscellaneous; a) Exchange current phenomena; b) Properties of some special classes of random matrices; c) Gauge-variant unitary transformations; d) Rescaling unitary transformations.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0053, HIGH-FREQUENCY ULTRASONIC WAVE AND PHONON PROPAGATION IN DIELECTRICS

C. ELBAUM, Brown University, Graduate School, *Providence, Rhode Island* 02912 (DMR77-12249)

This research was previously supported by DMR75-14761.

Research on phonon propagation and scattering in condensed matter will be carried out. The investigation will be in four areas: (1) Kapitza resistance: the heat pulse technique will be used to measure the reflection coefficient of phonons incident on an interface between silicon and solid helium at high pressure. Microscopic calculations of phonon transmission across interface will be performed for a number of simplified models of the surface region. (2) Accurate measurements of the velocity of roton second sound will be made in order to understand roton-roton interactions. (3) The mechanical and ultrasonic properties of solid helium will be studied by deforming it plastically in unconstrained shear. These deformation experiments will be followed by studies, using ultrasonic means, of the subsequent evolution of crystal defect behavior. (4) The propagation of ultrasonic waves in metallic glasses at low temperatures will be investigated and subsequently their thermal and electrical properties. Special emphasis will be directed to understanding the differences in the ultrasonic response of these glasses as compared with that of insulating glasses as well as crystalline metals and dielectrics.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0054, HIGH FIELD BUBBLE CHAMBER AND MULTIPARTICLE SPECTROMETER EXPERIMENTS

C.E. ROOS, Vanderbilt University, School of Arts & Sciences, *Nashville, Tennessee* 37232 (PHY73-08392 A07)

With a rapid cycling bubble chamber in a high magnetic field, properties of the sigma plus hyperon are being measured. A high-precision measurement of the sigma plus magnetic moment is the primary motivation. The two-body decay parameters, alpha and gamma, are being measured for both sigma plus and sigma minus. Branching ratios, angular distributions and polarization measurements will be obtained with much smaller uncertainties than in previous published work. Rare decays such as the p gamma decay made of the sigma plus will be studied.

This work represents a continuation of that currently supported by Foundation grant PHY73-08392 A06.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0055, POSITRONIUM REACTIONS IN THERMOTROPIC LIQUID CRYSTALS AND OTHER MOLECULAR SUBSTANCES

J.D. MCNUTT, Univ. of Texas, Graduate School, *Arlington, Texas* 76010 (Y-400)

The chemical reactions of positronium and the formation and properties of compounds of positronium have been studied by measuring the rate at which positrons annihilate in gases and in liquid crystals. Annihilation measurements in H2 gas indicate, at low gas densities, the formation of a meta-stable positron-hydrogen compound, e plus H2. The introduction of Ne to the H2

increases the e plus H2 formation probability, while decreasing the gas temperature enhances the stability of the compound towards auto-ionization. At higher H2 densities, the formation of e plus (H2)2 has been observed and has been semi-empirically described. Positronium-induced cavity formation has also been observed in H2 gas. Similar measurements with water vapor and nitrogen are planned.

The lifetime spectra of positrons annihilating in the solid, nematic and liquid phases of six of the first seven p,p'-di-alkoxyazoxybenzenes have been measured. Several of the annihilation parameters show an 'even-odd' alternation with the alkoxy carbon number similar to that observed for mesomorphic properties related to the strength of the intermolecular forces. Preliminary analysis suggests that the conversion of o-Ps to p-Ps near the azoxy group dominates the positronium reactions.

The construction of a timed positron beam system, which will allow the study of positron interactions at well-defined energies, is progressing rapidly.

SUPPORTED BY Robert A. Welch Foundation

8.0056, MOSSBAUER STUDIES OF IRON ORGANOMETALLIC COMPLEXES

R.L. COLLINS, Univ. of Texas, School of Arts & Sciences, *Austin, Texas* 78712 (F-158)

Several variations of Fe3(Cr(CN)6).H2O, prepared by Gary Beall of Baylor University, have been examined. The iron valences of one of these, as determined by ESCA, called for 1-Fe0 and 2-Fe3 ion. The Mossbauer data suggest for the same compound that one of the irons is FeIII(CN)6 and two are Fe3 ion high spin. If the Mossbauer evidence holds up, this represents a case for cyanide rotation during room-temperature oxidation. Some nickel-iron meteorites are being studied. These differ from terrestrial preparations in that their cooling rate was of the order one degree/million years, and so they represent a close idealization to equilibrium. Mossbauer spectra, X-ray diffraction, and chemical etching are being used to sort out the phases present, and the preliminary results are somewhat contradictory. The structure of the ferrocenium-boron compound, considered a possible zwitterion, has been resolved. The compound is an ion, with three ferrocenes and one ferrocenium attached analogous to the BF4 ion. On a time scale of 10 to the minus 7th power seconds, the three covalent bonded ferrocenes are clearly distinguishable from the ferrocenium ligand.

SUPPORTED BY Robert A. Welch Foundation

8.0057, DETERMINATION OF PROTON-INDUCED IONIZATION CROSS SECTIONS OF SELECTED METALS

A.R. ZANDER, East Texas State University, School of Science & Technology, *Commerce, Texas* 75428 (T-589)

Absolute proton-induced ionization cross sections have been determined for Ti, Cr, Fe, Ni and Zn (Z equals 22, 24, 26, 28 and 30, respectively) by bombarding highly purified forms of the metals with low-energy (100-150 KeV) protons and observing the characteristic X-rays emitted during the collision process. The metal targets were mounted in a specially constructed collision chamber which allowed in situ sputter cleaning of the targets. This was done to overcome the effects of carbon build-up which can be serious at the low bombarding energies utilized. The X-rays were detected with a cooled Si(Li) detector. The detector efficiency and solid angle were determined using calibrated X-ray sources.

The experimental results were compared to the theoretical predictions of the binary encounter and planewave Born approximation (PWBA) collision models in order to check the validity of those models at the low bombarding energies utilized. Correction factors were included in the PWBA.

Feasibility studies for determining absolute ionization cross sections of other metals in the Z equals 40-50 and Z equals 72-82 ranges are underway.

SUPPORTED BY Robert A. Welch Foundation

8.0058, THE DEPENDENCE OF IMPURITY CONDUCTION ON COMPENSATION IN TRANSMUTATION DOPED GERMANIUM

H.C. THOMAS, Texas Technological University, School of Arts & Sciences, *Lubbock, Texas* 79409 (D-553)

We have previously established that impurity conduction in transmutation doped germanium is unaffected by the decay of radioactive products for times greater than eleven days after irradiation, the half-life of the longest lived product. We are now measuring resistivities beginning four days after irradiation. The general behavior of the samples includes a range of Ga concentration of about 1 times 10 to the 15th power cm to the minus 3rd power with K, the compensation ratio, being about 1 for which the total resistivity is essentially independent of temperature. For a slightly greater Ga concentration and smaller K the resistivity increases initially with 1 over T, reaches a maximum, and then decreases with 1 over T. For higher concentrations and smaller K the resistivity increases to a maximum with 1 over T, and finally for still higher concentrations and lower K displays the rho equals rho oe epsilon 3/kT behavior expected for impurity hopping conduction. For a Ga concentration of 9.8 times 10 to the 14th power cm to the minus 3rd power the resistivity remains in the second range even after the radioactive decay is completed.

SUPPORTED BY Robert A. Welch Foundation

8.0059, PROTON AND ELECTRON EXCITATION OF X-RAYS

H.D. FETZER, St. Marys University, School of Arts & Sciences, *San Antonio, Texas* 78228 (U-515)

Characteristic X-ray excitation data have been obtained using 150 KeV protons. Thick targets of Al, Si, and Ti have been used for obtaining K X-ray data. L X-ray data from thick targets of Mo, Ag, Cd, and In, and M X-ray data from Ta, W, Au, Pb, and U were also obtained. Preliminary measurements comparing efficiencies of 150 KeV electron to proton excitation in Ti indicate that approximately five orders of magnitude more K X-rays per microamp are produced by electrons than by protons, although the peak to background ratio from the proton data exceeds that from the electron data.

Progress continues with the search for an appropriate substrate onto which we can deposit aqueous solutions of compounds containing elements of interest to X-ray studies. We have found that a glow discharge treatment facilitates uniform spreading of solutions on vacuum evaporated carbon films better than wetting agents used previously. Treatment by this method (several thousand volts across two electrodes in air at approximately 1 mm Hg pressure) causes the carbon film to become hydrophilic, thereby allowing the solutions to spread and dry with a good degree of uniformity.

SUPPORTED BY Robert A. Welch Foundation

8.0060, A MAGNETIC RESONANCE STUDY OF BASIC DEFECTS IN RUTILE

W.D. OHLSEN, Utah Higher Education System, School of Letters & Science, *Salt Lake City, Utah* 84112 (DMR74-17545 A01)

Continuation of research supported under DMR 74-17545.

The research will be concerned with an investigation of the defect structure of rutile crystals. Experiments will be carried out using magnetic resonance techniques. These will provide a microscopic view of defects on the atomic level. Among the defects to be studied are oxygen vacancies, titanium interstitials and impurities of hydrogen, niobium, tantalum, aluminium and bismuth. A new method for growing improved crystals of rutile will be pursued.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0061, CRYSTAL GROWTH FROM VAPORS

F. ROSENBERGER, Utah Higher Education System, School of Letters & Science, *Salt Lake City, Utah* 84112 (DMR75-03175 A01)

This research will be a fundamental study of the transport processes involved in crystal growth from the vapor phase. The

studies will be on silicon carbide (SiC) and rutile (TiO2), two materials of some technological interest. Emphasis will be placed on how compositional and structural homogeneity obtained during vapor phase growth depend on the mass and heat transfer conditions in the vicinity of the solid-vapor interface.

Matrix isolation spectroscopy will be used for the thermochemical characterization of the vapors to be studied. Flow instabilities resulting from the complex interaction of bouyancy-driven and forced connection in silicon reactor geometries will be investigated by high-resolution thermometry. The utility of laser Doppler Anemometry and holographic interferometry for flow visualization in vapor-solid processes will be demonstrated. Structural and morphological characterization of the crystals will be performed by scanning electron microscopy and X-ray diffraction, and chemical characterization by atomic absorption analysis and X-ray fluorescence.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0062, EXPERIMENTS USING WEAKLY LINKED SUPERCONDUCTORS
B.S. DEAVER, Univ. of Virginia, School of Arts & Sciences, *Charlottesville, Virginia* 22903 (DMR74-00424 A03)

This project, previously supported under DMR74-00424/AO1, will continue with experiments to investigate some fundamental properties of superconductors and to use weakly linked superconductors for new types of measurements. The research program includes studies of fluxoid quantization in unusual materials and geometries and several types of measurements to investigate the kinematics the Josephson oscillations in superconducting weak links. Magnetic measurements with superconducting devices to achieve high sensitivity and fast response time will be used to study the unusual magnetic properties that have been observed for lysozyme and sodium ammonia solutions, to investigate the newly discovered quasielastic state of some viral solutions and to try to observe transient magnetic effects produced by external stimulation or chemical reaction.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0063, PROMPT GAMMA RAYS FROM PION REACTIONS ON NUCLEI
H.O. FUNSTEN, Coll. of William & Mary, School of Arts & Sciences, *Williamsburg, Virginia* 23185 (PHY76-14878 A01)

Continued work is planned on experimental nuclear physics studies with positive and negative pions at the Space Radiation Effects Laboratory (SREL) Synchrocyclotron and at the Columbia University Nevis Synchrocyclotron. This work will extend current experiments at the Space Radiation Effects Laboratory in which prompt nuclear gamma rays associated with pion-nucleus reactions are observed with a Ge(Li) gamma-ray detector.

This work will be along two lines, 1) measurements of gamma rays from bound nuclear levels populated by 200 MeV positive pion inelastic scattering to see if the reaction excites predominantly a neutron or proton configuration; 2) search for excitation of analogue levels populated by (positive pion, neutral pion) reactions. Higher pion fluxes expected at Nevis will additionally permit use of scattered pion hodoscope counters for 1) and lead glass neutral pion yields 2 gamma detectors for 2).

This is work is a continuation of that currently supported by Foundation grant PHY76-15878.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0064, PARITY TESTS IN ATOMS
E.N. FORTSON, Univ. of Washington, Graduate School, *Seattle, Washington* 98105 (PHY74-17319 A04)

Experiments will be made in the area of studying optical transitions in atoms using tunable-laser light sources. The main experiment is a continuation of the search for parity non-conserving optical rotation in atomic bismuth. This experiment offers a way of studying the neutral weak current interaction in atoms, and of obtaining information about this interaction that is difficult to get from high-energy experiments. Other experiments with tunable lasers are in the planning stage and include high-resolution double-quantum spectroscopy of free hydrogen atoms. Outside the area of optical measurements, studies of low-energy (less than 0.1 eV) electron collisions using thermalized Penning-trapped electrons will be continued.

This work is a continuation of that currently supported by Foundation grant PHY74-17319 A02.

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

8.0065, TRICRITICAL PHENOMENA AND STATISTICAL MECHANICS
E.K. RIEDEL, Univ. of Washington, School of Arts & Sciences, *Seattle, Washington* 98105 (DMR77-12676)

Research begun under NSF Grant No. DMR 76-01070 will be continued and extended. Theoretical studies on the statistical mechanics of phase transitions and critical phenomena will be undertaken. Two types of problems will be studied in this general area: 1) scaling field approach to critical phenomena, and 2) model calculations. The scaling field research will be concerned with the completion of work on the basic formalism, the development and perfection of the calculational techniques, and tests through applications to specific systems. Model calculations will be performed for 1) phase transitions in quasi-two-dimensional systems, 2) percolation and critical phase transitions in systems with random defects, and 3) the structure of the interface between ordered phases.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

8.0066, STUDIES OF SURFACE STRUCTURES, LATTICE DYNAMICS AND ADATOM INTERACTIONS
M.B. WEBB, Univ. of Wisconsin, School of Letters & Science, *Madison, Wisconsin* 53706 (DMR76-21576)

The research program to study the atomic structure, thermal vibrations, phase diagrams, and the thermodynamic and kinetic properties of surfaces previously supported by NSF grant DMR74-11971 will be continued. The properties both of reconstructed surfaces of tetrahedrally coordinated semiconductors and of ordered and disordered adsorbed monolayers of noble gas atoms on metal surfaces will be studied using low-energy electron diffraction as the primary tool. Other auxiliary experimental techniques will also be used. This information will contribute to the understanding of the electronic and chemical properties of semiconductor surfaces and to knowledge of the interactions of adsorbed atoms with the substrate and with each other.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, MARINER-JUPITER-SATURN
L.A. SODERBLOM, U.S. Dept. of The Interior, Geological Survey, *Flagstaff, Arizona* 86001 (9580-01031)

Substantial revision to the baseline plan for the Mariner missions to Jupiter and Saturn (1977-1981) has resulted in a significant increase in the scientific potential of the mission. Aside from the major planets and rings, the satellites which are now targets for the mission are the Jovian satellites Io, Europa, Ganymede, Callisto, and J5 and the Saturnina satellites Titan, Tethys, Rhea, Dione, Mimas, Iapetus, and Hyperion. It is interesting to note that the sum total of the area of all the satellites which will be studied by photogeologic techniques is roughly equivalent to the total areas of Mercury, Mars, the Moon and those areas of the Earth above the hydrosphere.

The primary activities for fiscal 1977 include launch of all four of the MJS spacecraft. Launch data selections and design of the ground data handling system will finalized by June 1977. Following launch in August-September 1977 a near-Earth calibra-

tion sequence will be executed, using the Earth and Moon as targets, for performance tests of on-board equipment. Detailed design of the data acquisition sequences for Jupiter will begin during the last part of FY 77.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

10.0002, HIGH-SPECTRAL-RESOLUTION POLARIMETRY OF STARS
G.V. COYNE, Univ. of Arizona, School of Liberal Arts, *Tucson, Arizona* 85721 (AST77-08386)

The aim of this study will be to obtain and interpret polarimetric data at high spectral resolution on a large sample of stars which are known to exhibit considerable polarization structure with wavelength. These include Be and shell stars, close binaries, X-ray binaries, dwarf novae and late-type giant stars. This work will be directed towards an interpretation of those stellar objects with extended atmospheres and/or circumstellar environments, including stars involved in mass exchange or mass loss.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0003, STUDY THE FEASIBILITY OF DEVELOPING THREE TELESCOPES IN THE 100-1000A RANGE
C.S. BOWYER, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (NAS 5-24189)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

10.0004, STRUCTURE OF STELLAR SYSTEMS
I.R. KING, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (AST76-00530 A01)

The research will involve the study of the structure of various types of stellar systems, including stars in the local neighborhood. The local galactic structure project has two parts: a) Magnitudes and colors of faint stars will be analyzed to determine the local density of dwarf stars, their local density gradient, and their luminosity functions. The study will distinguish between stars inhabiting the galactic disc and the galactic halo. b) Proper motions of these same stars will be measured and re-analyzed.

Magnitudes and colors of faint galaxies will be measured in several regions on the sky, and their distribution will be analyzed. The results will bear on the value of the deceleration parameter, the homogeneity of the universe, the evolution of galaxies, and their luminosity function.

Another project is a study of the dynamics of star clusters. Properties of detailed dynamical models will be studied, particularly with regard to the interactions of stars of different masses.

This action provides additional funding and extends the duration of the grant number AST76 00530 for 12 months.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0005, THEORETICAL STUDIES IN INTERSTELLAR PHYSICS
C. MCKEE, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (AST75-02181 A02)

A wide variety of theoretical problems in stellar, interstellar, and high-energy astrophysics will be considered. In stellar astrophysics, the research will include the investigations of mass transfer and accretion onto magnetized neutron stars; non-local thermodynamic equilibrium theory of X-ray reprocessing in stellar atmospheres; and an atlas of theoretical light and velocity curves of contact binaries. Interstellar problems will include the research on the interactions of gas, dust, molecules, and stars; cloud evaporation; collapse of interstellar clouds and binary star formation; and the properties of the hot component of the interstellar medium. The main effort in high-energy astrophysics will be the study of astrophysical processes which occur in or near exotic objects such as pulsars and quasars. In particular, processes concerned with radiative Rayleigh-Taylor instabilities, compact variable sources, and dynamics and excitation in the Crab nebula will be considered.

This is a continuation of work previously supported by NSF grant AST75 02181.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0006, STUDY FOR ACCOMMODATION OF GIANT PASSIVE DETECTOR OF EXOTIC PARTICLES IN COSMIC RAYS ON SHUTTLE/SPACELAB MISSIONS (ABBREV)
P.B. PRICE, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (NAS 5-24166)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

10.0007, GENERAL RELATIVITY AND COSMOLOGY
R.K. SACHS, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (PHY77-15191)

Research in mathematical relativity and cosmology initiated under NSF grants MCS76-21525 and PHY76-08961 will be continued. Topics to be investigated include: 1. Structure of spacial infinity (Hansen) 2. H-space (Hansen) 3. Homogeneous cosmological models (Bachs) 4. Study of generic singularities in relativity (Tipler) 5. Cosmic censorship hypothesis (Tipler).

SUPPORTED BY U.S. National Science Foundation, Div. of Physics

10.0008, THEORETICAL STUDIES IN SPACE ASTRONOMY
J.M. SHULL, Univ. of California, Graduate School, *Berkeley, California* 94720 (NSG 5201)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

10.0009, ASTRONOMICAL OBSERVATIONS IN THE INFRARED AND ONE-MILLIMETER REGIONS, WITH EMPHASIS ON SPECTROSCOPY AND INTERFEROMETRY
C.H. TOWNES, Univ. of California, School of Letters & Science, *Berkeley, California* 94720 (AST77-12256)

A variety of instruments and new techniques have been developed in the laboratory at the University of California, Berkeley, over the last several years for improving the angular resolution and the spectral detail of astronomical observations in the wavelength range generally described as infrared and far infrared. This developmental work will continue under separate support. A number of instruments resulting from this program are now being used for extensive observations at various established astronomical observatories. The instruments include a spatial interferometer for measurement of the size of infrared stars and sensitive spectrometers for measuring the abundance and characteristics of ions and molecules in interstellar clouds or stellar atmospheres. The information is important to understanding the origin and dynamics of these objects, stellar formation, and nuclear processes during the life of our galaxy. Wavelength regions in which research can be done include the 5 micron, 10 micron, 20 micron and 1 millimeter windows of the atmosphere. The research will be carried out at several locations in the northern hemisphere and in Chile to study objects in the southern skies.

This is a continuation of work previously supported by NSF grant AST75-20353.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0010, MAGNETIC STRUCTURES AND FIELD RECONNECTION - MECHANISMS OF SOLAR-TERRESTRIAL ACTIVITY
G. VANHOVEN, Univ. of California, School of Physical Sciences, *Irvine, California* 92664 (ATM77-09581)

Sheared magnetic fields and current-sheet dynamics are believed to dominate solar and magnetospheric activity. This grant has several related objectives concerning the fields and currents. They include the study of nearly force-free magnetic structures in non-uniform situations and the further consideration of loop configurations, with attention to their flare, or resistive-instability, behavior. A desire to improve on a magnetic-tearing model underlies the investigation of modifications of the basic mechanism due to heating effects (connected with the thermal instability) and secondary observable characteristics, such as acceleration and resistivity (flare-phase) transitions.

The ultimate aim of this research is the development of empirical tests which will demonstrate the reality of the various proposed solar (and auroreal) field-structure and flare-reconnection models, including those involving resistive tearing.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0011, ASTRONOMICAL OBSERVATIONS AT MILLIMETER AND SUB-MILLIMETER WAVELENGTHS

M. WERNER, Calif. Inst. of Technology, Graduate School, *Pasadena, California* 91109 (AST76-81092)

A 10.4 meter prototype telescope for millimeter wavelengths has been designed and built by Dr. R.B. Leighton of California Institute of Technology (CIT). This telescope is now at Owens Valley Radio Observatory (OVRO). A second telescope (1.6 meter) previously used for a 2 micron sky survey has been moved from Mt. Wilson to White Mountain to be used jointly with the Astronomy Laboratory of the University of California, Berkeley. The altitude at the White Mountain site is 13,000 feet and an additional purpose of the move of the 1.6 meter telescope is to test White Mountain as a potential site for a 10.4 meter telescope.

A two-part program using the 1.6 meter and 10.4 meter telescopes for observations at wavelengths of 1 millimeter and shortward will be carried out. Firstly, initial observations on the 10.4 meter telescopes will be carried out at Owens Valley using the composite bolometer detecting system which has been used successfully for several years for 1 millimeter observations on the 200 inch telescope. Secondly, the observations with the 1.6 meter telescopes on White Mountain will be continued. The experience gained from the observations will be quickly fed back into a substantial program of instrumental development intended to produce improved photometers and detectors optimized for use with the existing telescopes and with a future 10.4 meter telescope to be located at a good dry site, possibly White Mountain.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0012, RADIO-WAVE DIAGNOSTIC STUDIES OF THE EARTH'S PLASMA ENVIRONMENT

V.H. RUMSEY, Univ. of California, School of Engineering, *San Diego, California* 92038 (ATM75-13451 A03)

This grant will continue the support of an observatory at the University of California, San Diego, which uses interplanetary scintillations (IPS) to make daily measurements of the solar wind speed, direction, and the spectrum of electron density. These observations cover solar latitudes from minus 60 degrees to 80 degrees and radial distances from 70 to 280 solar radii. By using several different radio sources, many different regions are probed simultaneously. This grant will continue regular observations and use them to study the structure and evolution of corotating streams and transients, and study the long-period variations of the 'average' properties of the solar wind. The detailed structure of corotating streams will be examined by comparison of these data with simultaneous International Magnetospheric Probe (IMP) 7 and 8 NASA satellite plasma data in the ecliptic plane. The streams will be mapped back to the latitude and longitude of their solar origin and be compared with solar observations, in particular with those of coronal holes and of the coronal magnetic fields.

The investigators will also analyze IPS data in order to refine the model of the electron density spectrum as a function of spatial wave number and of distance from the sun. In particular, data recorded between 2 and 50 solar radii will be analyzed to study the solar wind in the acceleration region. Thus, the overall aim of this grant is to study the way in which the solar atmosphere is supersonically blasted away from the sun to develop into the solar wind.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0013, SPECTROPHOTOMETRY OF QUASI-STELLAR OBJECTS

J.S. MILLER, Univ. of California, Lick Observatory, *San Jose, California* 95060 (AST76-20843)

Though their existence was recognized over 12 years ago, the quasars (short for 'quasi-stellar radio sources', but also called 'quasi-stellar objects' or 'QSOs') remain enigmatic objects. Many astronomers believe they represent very energetic events taking place at great distances, but even their distances are a matter of dispute. The objective of the research is to obtain fundamental quantitative data on the optical spectra of a large sample of quasars. A systematic survey of a fairly large sample of QSOs using the Lick Observatory 120 inch cassegrain image-tube scanner to obtain moderate-resolution spectrophotometry will be carried out. Such parameters as emission-line intensities and profiles, continuum spectral energy distributions, and polarizations will be measured. These data will be used to investigate the physical processes taking place in QSOs and as a basis for comparison with published models for them. Also, evidence for systematic behavior in the optical spectra of QSOs as functions of apparent magnitude, redshift, radio properties, and degrees of variability will be a major component of the study. The information on the physical conditions in quasars will be analyzed for clues to the relationship they may have to other kinds of objects and to the role they play in the universe in general.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0014, THE EVOLUTION OF THE PLANETS JUPITER AND SATURN

P.H. BODENHEIMER, Univ. of California, Graduate School, *Santa Cruz, California* 95060 (AST76-17590)

The evolution of Jupiter and Saturn will be studied under the basic assumption that the planets originated as chemically homogeneous and gravitationally bound subcondensations in the solar nebula. A principal aim is to determine the role of angular momentum in the evolution of the subcondensations, using 2-dimensional hydrodynamic and hydrostatic computer codes developed for stellar evolution. Preliminary work shows that (under certain physically reasonable initial conditions) the formation of a giant planet and its major satellites from the same cloud is plausible. A study of the early part of such a process will be made including factors which result in redistribution of angular momentum, and circumstances for the formation of satellites by accretion of small particles in a rotating cloud. Planets and satellite systems are analogs of the solar system as a whole. The results may carry implications regarding the validity of the nebular theory of the origin of the solar system.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0015, THEORETICAL NUCLEAR ASTROPHYSICS

S.E. WOOSLEY, Univ. of California, Graduate School, *Santa Cruz, California* 95060 (AST76-10933)

The results of many recent experimental and semi-empirical determinations of nuclear cross sections will be applied to a variety of current astrophysical problems. Topics to be considered include: 1) the origin of the chemical elements (nucleosynthesis) in novae, supernovae, and in the early universe; 2) the age of the galaxy as determined by the measured abundance ratio of the isotopes Rhenium 187 to Osmium 187; and 3) possible restrictions that can be placed on models of supernovae and cosmology by virtue of their expected nucleosynthesis.

In addition, a large amount of theoretical nuclear cross-section and reaction-rate information calculated in the past few years will be disseminated to the nuclear physics and astrophysics communities.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0016, OPERATION OF ION MICROPROBE AS GEOCHEMICAL FACILITY
R.N. CLAYTON, Univ. of Chicago, Graduate School, *Chicago, Illinois* 60637 (EAR76-02754 A01)

This is a continuation of research supported under NSF grant EAR76-02754.

This project concerns a method of chemical and isotopic analysis of minerals using the ion microprobe and the application of this method to a study of the chemical and isotopic composition of minerals in meteorites and terrestrial rocks. The ion microprobe has a sensitivity limit in the part-per-million range for many elements and is capable of making an analysis of areas a few microns in diameter. The instrument has been applied to a determination of the isotopic composition of magnesium in minerals from the Allende meteorite, which contains excess 26Mg derived from the decay of primordial 26Al and to the analysis of plagioclase feldspars.

The ion microprobe will be calibrated to do trace-element analyses through the use of specially prepared glasses of the requisite composition. Once the calibration is accomplished the trace-element technique will be applied to a study of trace-element distributions in mantle rocks and in meteorites. This facility is providing a method of attacking previously intractable geochemical problems.

SUPPORTED BY U.S. National Science Foundation, Div. of Earth Sciences

10.0017, PLANETARIUM LABORATORY IN ASTRONOMY
L.A. WILLSON, Iowa State Univ. of Sc. & Tech, School of Hum. & Sciences, *Ames, Iowa* 50010 (SER77-02816)

A multilevel, individualized model of instruction in astronomy is to be developed at Iowa State University using a classroom-planetarium to improve comprehension of basic astronomical ideas and to increase student interest and involvement. The program proposed for the first two years involves (1) installation and preparation of the planetarium facility and (2) preparation of lecture demonstration units and individual project modules for use with the planetarium. Expected outcomes include improved student performance and comprehension, increased interest in the elementary courses, more direct understanding of basic astronomy, and wider community involvement in astronomy.

SUPPORTED BY U.S. National Science Foundation, Div. of Science Education Resources Improvement

10.0018, INVESTIGATION OF A GROUP OF DENSE ROTATING INTERSTELLAR CLOUDS WHICH ARE UNDERGOING EXTENSIVE FRAGMENTATION
F.O. CLARK, Univ. of Kentucky, School of Arts & Sciences, *Lexington, Kentucky* 40506 (AST76-80200)

In the Taurus region of the sky there is a group of interstellar gas clouds which are rotating, extensively fragmented, and probably in a state of gravitational collapse. These clouds will be studied by means of the microwave spectral lines of the common interstellar molecules formaldehyde, hydroxyl radical, and carbon monoxide. The study will determine the physical parameters of these clouds, such as kinetic temperature, density and density gradient, kinematics (rotation, fragmentation, and other measurable motions), and possibly also chemistry. The study will establish the details of rotation and fragmentation for this group of interstellar clouds, and demonstrate how the collapse motions are consistent with the conversation of angular momentum. The results will be useful for understanding how these processes actually take place and will provide an observational basis for theoretical calculations of realistic models which include rotation. The study is based on preliminary results which show unexpected detailed fragmentation taking place.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0019, SLIT JAW CAMERA GUIDANCE SYSTEM FOR SHUTTLE TELESCOPES STUDY
W. FASTIE, Johns Hopkins University, School of Arts & Sciences, *Baltimore, Maryland* 21218 (NAS 5-24236)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

10.0020, A COMPLETE SURVEY OF GALAXY REDSHIFTS TO MV EQUALS 14.5 USING A PHOTON-COUNTING DETECTOR ARRAY
M. DAVIS, Harvard University, Harvard College Observatory, *Cambridge, Massachusetts* 02138 (AST76-22675)

A photon-counting array will be used in a program to measure the redshifts of a complete sample of galaxies to a limiting magnitude of approximately 14.5. The resulting catalog of redshifts will provide unique data for research in extragalactic astronomy. Intended uses of the catalog include: 1) direct measurement of the galaxy-galaxy covariance function using the redshift as a distance indicator; 2) improved determination of the luminosity distribution of galaxies and hence of the luminosity density of galaxies; 3) improved understanding of the dynamics of galaxies within approximately 50 megaparsecs of the Milky Way. These questions are of direct relevance to the issue of whether the Universe is closed or open, and the results of the survey will play an important role in resolving the issue.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0021, X-RAY BALLOON OBSERVATIONS FROM THE NORTHERN AND SOUTHERN HEMISPHERES
W.H. LEWIN, Mass. Inst. of Technology, School of Science, *Cambridge, Massachusetts* 02139 (NSG 7339)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

10.0022, SOLAR ATMOSPHERIC DYNAMICS
R. STEIN, Michigan State University, Graduate School, *East Lansing, Michigan* 48824 (DF248840; F19628-77-C-0068)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate solar disturbance predictions. Objective - to determine the energy transport mechanisms operating that heat the solar corona and drive the solar wind. How research contributes - provides information on which solar functions, such as oscillations, give rise to coronal and solar wind flows.

Calculate the driving of the solar atmospheric (300 second) oscillation resulting from thermal overstability of acoustic and magnetic modes in the super-adiabatic convection zone and the propagation, refraction and dissipation of these oscillations in the solar corona. Such results can then be used to determine what photospheric oscillation configurations give rise to the solar wind.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PH, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

10.0023, ANALYSIS OF VELOCITY MAPS, NON-LINEAR OSCILLATIONS AND WAVE-DRIVEN WINDS
K.H. PRENDERGAST, Columbia University, School of Arts & Sciences, *New York, New York* 10027 (AST77-07841)

Three theoretical projects will be carried out.

The first project concerns the development of model-building techniques of sufficient power to exploit the high-resolution velocity data now coming out of Westerbork, Holland. The case of M 101 will be considered in some detail, but the methods proposed should be applicable to any galaxy which has survived a collision without total disruption. Criteria will be developed which will enable one to recognize a collision when seen, and to distinguish collision-induced irregularities from those due to other causes.

The second project concerns non-linear mechanics and its applications to astronomical problems, such as the theory of orbits. A new method has been found for treating non-linear oscillations, which in its simpler versions is related to Pade approximation applied to Fourier series. Astonishingly good results are obtained for some of the classical test cases, such as Duffing's equation and the van der Pol oscillator.

The third project is to investigate the possibility that travelling waves in a stellar atmosphere can generate a Reynolds stress strong enough to drive a wind. This question has been examined for small amplitude waves and it was found how the mean mass flux and terminal velocity are related when these waves are present. The investigation will be extended into the non-linear regime, and the results applied to a discussion of A-type supergiants with macroturbulence.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0024, SUNSPOTS

J.H. THOMAS, Univ. of Rochester, School of Engin. & Appl. Sci., *Rochester, New York* 14627 (DF249000; F19628-77-C-0079)

AF function - communications, surveillance, detection, tracking. Deficiency - inadequate solar disturbance predictions. Objective -determine quantitative structure and dynamics of magnetic fields in solar sunspot regions. How research contributes - knowledge of solar magnetic field behavior is necessary to understand the role fields play in flare production.

Apply theoretical magnetohydrodynamics to observed motions and field configurations in sunspot umbrae and penumbrae. Such research will provide an insight into the physics of magnetic fields in spots and their impact on adjacent solar flare producing plage regions.

ADDENDA: Supporting agency address is: AF Geophysics Laboratory PH, Hanscom AFB, Bedford, Mass 01730

SUPPORTED BY U.S. Dept. of Defense, Air Force

10.0025, LONG-RANGE ANTINEUTRINO BURST DETECTOR

K.E. LANDE, Univ. of Pennsylvania, School of Arts & Sciences, *Philadelphia, Pennsylvania* 19104 (AST76-17786)

A 500 cubic meter antineutrino burst detector will be built at the Homestake Gold Mine in Lead, South Dakota. The detector will utilize the water shield surrounding the Brookhaven Solar Neutrino Detector at the mine, and is designed to detect the neutrinos and antineutrinos emitted when a star undergoes a supernova explosion. The instrument will be able to detect the occurrence of such an explosion anywhere within the Galaxy. The detector will also be able to measure the angular distribution of high-energy neutrinos and antineutrinos produced by cosmic rays in the Earth's atmosphere.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0026, STUDIES OF SOLAR-TERRESTRIAL RELATIONSHIPS AS MANIFESTED BY COSMIC-RAY INTENSITY

M.A. POMERANTZ, Franklin Inst. of State of Pa., *Swarthmore, Pennsylvania* 19081 (ATM77-12615)

This grant supports investigations of a variety of solar-controlled phenomena by analyses of cosmic-ray data recorded by ground-based detectors in conjunction with related solar and interplanetary observations. The work will focus on the unique potential of observations of modulations, anisotropies, and the flow patterns of relativistic cosmic rays for deducing critical information regarding large-scale electrodynamic properties of the solar atmosphere from the sun's immediate vicinity to the outer heliosphere. The principal objective is to study already available and forthcoming experimental results in order to further test, refine, and develop theoretical models of the physical mechanisms that give rise to transient and long-term intensity variations, radial and perpendicular gradients, three-dimensional anisotropies, periodic waves, and scintillations of galactic cosmic rays, and acceleration, coronal transport, injection, and interplanetary propagation of relativistic solar cosmic rays. Provision for the continued operation, during the impending period of increasing solar activity, of the Thule neutron monitor, which is a source of crucial data for all of these studies, will be made.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0027, COMPARISON OF SPREAD F THEORY WITH MEASUREMENTS BY THE INCOHERENT-SCATTER TECHNIQUE

E.H. KLEVANS, Penn. State University, Ionosphere Research Laboratory, *University Park, Pennsylvania* 16802 (ATM77-06718)

This grant funds a theoretical and experimental study of ionospheric F-region irregularities (Spread F). Experimental work will be done using the National Astronomy and Ionosphere Center's incoherent-scatter radar at Arecibo, Puerto Rico. A study has already been completed of ionogram data for several years from Puerto Rico which has allowed the start times and probability of occurrence to be established as a function of time of day, season and solar activity. Based on this study an investigation was made of the high-resolution data in the archives at Arecibo from the standard monthly ionospheric runs. These data have provided valuable information on the winds, conductivities and electric fields for series of observations at various seasons and for nights with and without spread F.

Based on these observations and on comparisons of these data with theoretical models, a series of definitive experiments has been designed which will supplement the proceeding studies and provide the information required to classify several of the remaining criteria relevant to the initiation of Spread F irregularities.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0028, SPECIAL FOREIGN CURRENCY AWARD TO STUDY EVOLUTIONARY STATUS OF THE RS CVN AND U GEM TYPES OF CLOSE BINARY SYSTEMS (ABBREV)

J. SMAK, Polish Academy of Sciences, *Warsaw, Poland* (INT76-80588)

The N. Copernicus Astronomical Center of the Polish Academy of Sciences, Professor Jozef Smak, Principal Investigator, proposes to study close binary systems, one of the most challenging and significant fields in stellar astrophysics, in cooperation with Professor John P. Oliver, University of Florida, and Douglas S. Hall, Dyer Observatory, Vanderbilt University. The researchers in this cooperative effort will jointly use the resources of the N. Copernicus Astronomical Center in Warsaw and the Kitt Peak National Observatory.

The study of the properties and evolutionary status of the RS CVn and Gem type of binaries will include the following topics: 1. A model and evolutionary history of the peculiar binary V 471 Tau. 2. Determination of the basic physical characteristics of U Gem, as a prototype of the U Gem-type binaries. 3. Discussion of the properties of two eruptive binaries: T CrB and VZ Scl. 4. Study of the ultra-short period, transient oscillations in the U Gem-type binaries at their outbursts. 5. Characterization, based on photoelectric and spectroscopic data, of the physical characteristics of RS CVn-type binaries. 6. Models, involving the stellar wind mechanism, to describe the present evolutionary status of the RS CVn-type binaries. 7. Survey of models, including the stability analysis, of the mass-accreting white dwarfs, with application to the U Gem-type binaries.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

10.0029, A DUAL APPROACH TO IMPROVING AN ASTRONOMY COURSE

R.J. DUKES, Coll. of Charleston, Graduate School, *Charleston, South Carolina* 29401 (SER77-03389)

This project has been conceived and designed to maximize opportunities to learn basic concepts in astronomy and to capitalize on student interest in astronomical observations. The objectives, hence, are twofold. First, 20 single-concept, color video

tapes will be produced. Each 5-15 minute tape will focus on a basic scientific concept central to understanding astronomy. Second, an integrated set of 40 observationally oriented exercises will be developed. In addition to outdoor exercises, indoor inclement-weather exercises will, in general, utilize observations that the students have made. For each exercise we will develop two sets of instructional materials, one for students and one for instructors. The latter will include background information, hints for running the laboratory, indications of possible areas of student difficulty, and an equipment list.

The video tapes will supplement lectures, readings, and individual instruction. They will provide commuting and working students with the opportunity to gain out-of-class help in understanding basic concepts. It is expected that use of the tapes will increase the amount of class time available for the introduction of important new developments. The observational laboratory exercises are intended to expand on a proven idea. Students enjoy hands-on experiences, and learn from them. Such experiences stimulate student interest in the lecture material.

SUPPORTED BY U.S. National Science Foundation, Div. of Science Education Resources Improvement

10.0030, PHOTOMETRY, SPECTROSCOPY AND INTERFEROMETRY OF IRREGULAR GALAXIES

G.H. DEVAUCOULEURS, Univ. of Texas, School of Natural Sciences, *Austin*, *Texas* 78712 (AST75-22900 A01)

The optical study of irregular galaxies is one of the neglected areas of extragalactic research. The paucity of optical data hinders the interpretation of radio observations of the strong 21-cm neutral hydrogen line emissions. The high rate of star formation, rapid evolution and complex dynamics in these galaxies are of great theoretical interest.

A comprehensive program of studies of late-type spiral and irregular galaxies will be carried out. Photometry, spectroscopy, and interferometry will be done to provide basic data. These data will provide information on the structure, luminosity, magnitudes and distances to the galaxies. In addition, the space densities, rotations, motions, ionized hydrogen regions, and total masses of these galaxies will be investigated. The research will lead to significant advances in the theoretical understanding of the physics, dynamics and evolution of hydrogen-rich, late-type spiral and irregular galaxies.

This is a continuation of work previously supported by NSF grant AST75-22900.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0031, LUNAR TECTONICS THROUGH SPACE AND TIME

W.R. MUEHLBERGER, Univ. of Texas, School of Natural Sciences, *Austin*, *Texas* 78712 (NSG 7363)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

10.0032, SPACECRAFT EVIDENCE FOR SULFUR IN THE CLOUDS OF VENUS

A. YOUNG, Texas A & M University System, School of Science, *College Station*, *Texas* 77843 (NSG 7370)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

10.0033, THEORETICAL STUDY OF PLASMA FLOW INTERACTIONS WITH PLANETS

P.A. CLOUTIER, Rice University, Graduate School, *Houston*, *Texas* 77001 (ATM77-12996)

This grant will support theoretical research on the interaction of flowing plasmas with planetary bodies in continuation of the investigations conducted under previous NSF Grants GA 28033x and DES 74-19668. Work to date under these grants has been directed at an understanding of solar-wind interactions with the atmospheres and ionospheres of non-magnetic or weakly magnetic planets such as Venus and Mars, and has led to formulation of models which appear to explain the general features of the flow of solar wind plasma in the vicinity of these planets. However, a more detailed study will be undertaken to allow predictions of localized atmospheric profiles and structures, including effects of asymmetries in flow patterns, variations in atmospheric parameters with time and geographic location, and especially the effects of photochemistry, diffusion, and thermalization. The major aims of this work are to produce a quantitative model relevant to and an understanding of the PVO physical mechanisms concerning the interaction of the solar wind with planetary atmospheres.

SUPPORTED BY U.S. National Science Foundation, Div. of Atmospheric Sciences

10.0034, PHOTOMETRIC AND SPECTROGRAPHIC INVESTIGATIONS OF DWARF CEPHEID VARIABLE STARS

D.H. MCNAMARA, Brigham Young University, School of Engin. Sci. & Tech., *Provo*, *Utah* 84602 (AST75-19751 A02)

This is the second and final year of a continuing grant, AST 75-19751. Photometric and spectrographic studies are being carried out for several dwarf cepheid variable stars. The photometry will be secured in the uvby and khg photometric systems. The photometry will yield accurate information on color excesses, temperatures, surface gravities, and metal abundances of the stars. Spectroscopic observations of the stars will be secured to yield accurate velocity curves and mean velocities. The new data will be used in identifying the population type and evolutionary state of these important variable stars, the stellar masses and absolute magnitudes that can be important variable stars. The stellar masses and absolute magnitudes that can be derived from pulsation theory and observations should aid us in understanding the physical properties and evolutionary history of population II stars.

This is a continuation of work previously supported by NSF grant AST75-19751.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0035, FUNDAMENTAL PROPERTIES OF NONTHERMAL EMISSION MECHANISMS IN RADIO SOURCES

J.J. BRODERICK, Virginia Poly. Inst. & St. U., Graduate School, *Blacksburg*, *Virginia* 24061 (AST77-08013)

The fundamental properties of nonthermal emission mechanisms will be studied by radio astronomical techniques. The conditions required for the production of detectable nonthermal radio emission by stars, and the mechanisms by which it is produced, will be investigated by a series of complete radio surveys of 400 stars within 20 pc of the Sun. Sensitive surveys at 13 and 6 cm of several thousand galaxies brighter than mp equals 14.5 have been made and will be used to test current hypotheses relating radio structures and intensities to optical morphology, luminosities, and line spectra. Confusion-limited scans at 21 and 13 cm made in association with these surveys will be used to obtain statistical (P(D)) extragalactic source number counts and to detect possible anisotropy at the 1 m.1y level. Very long baseline (VLB) interferometric observations of complete samples of extragalactic sources will be continued to isolate the effects of self-absorption and electron energy distributions on compact source spectra, and to relate source optical luminosity and morphology to radio core flux. Very long baseline pulsar data will be analyzed to yield unresolved calibration sources and information about the interstellar medium through a comparison of scattering sizes with dispersion measures. Interstellar scintillation observations will be made at low frequencies to find, or at least set strict limits on, possible high-brightness coherent emission mechanisms in extragalactic sources. The current research on optical identifications and spectroscopy of compact extragalactic sources will be continued. The nature of the hydrogen absorbing clouds in front of the quasi-stellar object 3C 286 and the BLLac object AO 0235 164 will be investigated using spectral-line VLB techniques. This is a continuation of work previously supported by NSF grant AST75-11139.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0036, OBSERVATION OF THE SATELLITES OF THE OTHER PLANETS
P.A. IANNA, Univ. of Virginia, School of Arts & Sciences, *Charlottesville, Virginia* 22903 (NSG 7364)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

10.0037, STELLAR EVOLUTIONARY PATTERNS IN LMC CLUSTERS
P.W. HODGE, Univ. of Washington, School of Arts & Sciences, *Seattle, Washington* 98105 (AST76-17598)

The Magellanic Clouds provide, because of their proximity to our galaxy, opportunities for several different kinds of research. The remarkably rich young star clusters in the Magellanic Clouds can give us an opportunity to carry out observational stellar evolutionary studies. The importance of this opportunity was first recognized by Arp (1958) and the first comparisons with theory were given by H. Arp (1967). Dr. H. Arp compared an accurately measured color magnitude diagram for the object NGC 1866 with Iben's models of stellar evolution. Dr. I. Iben (1967) also made a detailed analysis of this cluster.

Theoretical stellar evolutionary tracks computed by Flower, Kozlowski and Paczynski provide a multi-dimensional array of models that can be compared to color magnitude diagrams of star clusters. This new theoretical data will be used in conjunction with color magnitude diagrams of rich young clusters ('blue globulars') of the Large Magellanic Cloud. The clusters are unique in having large enough numbers of giant stars to allow detailed comparison. New observations carried out with the 4-meter Cerro Tololo Interamerican Observatory telescope in Chile will be used for this purpose.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

10.0038, SURVEY OF SPECTRAL AND POLARIMETRIC VARIABLE QUASI-STELLAR OBJECTS
K.H. NORDSIECK, Univ. of Wisconsin, School of Letters & Science, *Madison, Wisconsin* 53706 (AST77-06977)

An observational search for members of the class of quasi-stellar objects (QSOs), often called 'violent variables', will be carried out using a portable multi-channel spectropolarimeter being built at the University of Wisconsin. The instrument will be used at the Cassegrain spectrograph of the 4-meter telescope at Kitt Peak National Observatory. The instrument is particularly suited for obtaining the spectrum (7 Angstrom resolution) and polarizations (50-200 Angstrom resolution) of an object simultaneously over a range of 4000 Angstroms. From lists of optically identified QSOs and radio compact variable sources, members of this class will be rapidly identified from their characteristically large optical polarization (often 5-30 percent). The additional integration time will make a more exact value of the polarization and the details of the spectrum available and unprofitable telescope time on chance foreground stars will be avoided. The QSOs are important in that the variability provides clues to the still mysterious central energy source of quasi-stellar objects and to the relationship of the optical and radio objects. A moderate-sized list of active sources, using a correlation of variability and spectrum, will be used to enhance the probability of observing objects while they are exhibiting rapid variability.

SUPPORTED BY U.S. National Science Foundation, Div. of Astronomical Sciences

GENERAL

11.0001, OPERATION OF AN INDUSTRIAL APPLICATIONS CENTER
UNKNOWN, Univ. of Pittsburgh, Graduate School, *Pittsburgh, Pennsylvania* 15213 (NASW 3042)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Organization & Management, Office of University Affairs

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Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N78-10001*+ National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A SPECIAL BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 86
Aug. 1977 108 p
(NASA-SP-7037(86)) Avail: NTIS E02 CSCL 01A

This bibliography lists 360 reports, articles, and other documents introduced into the NASA scientific and technical information system in July 1977. Author

N78-10002*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CALCULATED HOVERING HELICOPTER FLIGHT DYNAMICS WITH A CIRCULATION CONTROLLED ROTOR
Wayne Johnson and Inderjit Chopra Sep. 1977 40 p refs
Prepared in cooperation with Army Aviat. Res. and Develop. Command, Moffett Field, Calif.
(NASA-TM-78443; A-7227) Avail: NTIS HC A03/MF A01 CSCL 01A

The influence of the rotor blowing coefficient on the calculated roots of the longitudinal and lateral motion was examined for a range of values of the rotor lift and the blade flap frequency. The control characteristics of a helicopter with a circulation controlled rotor are discussed. The principal effect of the blowing is a reduction in the rotor speed stability derivative. Above a critical level of blowing coefficient, which depends on the flap frequency and rotor lift, negative speed stability is produced and the dynamic characteristics of the helicopter are radically altered. Author

N78-10003# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
AVIONICS MAINTENANCE STUDY Final Report, Jan. - 31 Jun. 1976
P. R. Owens, M. R. StJohn, and F. D. Lamb Jun. 1977 107 p
(AF Proj. 6096)
(AD-A042568; AFAL-TR-77-90) Avail: NTIS HC A06/MF A01 CSCL 09/3

Avionics maintenance has become a major contributor to the life cycle cost of weapons systems and this study was undertaken to gain insight into factors contributing to the cost of avionics maintenance. To become familiar with the procedures employed and operating conditions encountered in the operational Air Force, a team from the Air Force Avionics Laboratory visited several avionics maintenance squadrons, along with depot organizations at Air Logistics Centers. Through interviews with both supervisors and maintenance technicians at these organizations, a familiarization with the working level procedures was acquired. Similarities and differences in procedures, personnel, test equipment, complaints, and equipment supported at installations under different major commands were noted. A wide range of avionics from old, tube type equipment through the latest solid-state equipment just being introduced into the inventory was considered in the selection of organizations to be visited. Difficulties in obtaining replacement parts and dissatisfaction with test equipment were found to be the problems most often voiced by maintenance personnel. To persons from a laboratory environment, the age of some equipment still in use was shocking and the necessity for designing avionics to provide reliable service for 15 to 20 years was strongly realized. The need for early consideration of ATE requirements to insure rapid, cost-effective fault isolation in new avionics design is emphasized as one conclusion to the study. Author (GRA)

N78-10004# Air Force Human Resources Lab., Brooks AFB, Tex.
USER ACCEPTANCE AND USABILITY OF THE C-141 JOB GUIDE TECHNICAL ORDER SYSTEM Final Report, Jun. 1975 - Feb. 1977
Robert C. Johnson, Donald L. Thomas, and Deborah J. Martin Jun. 1977 77 p
(AF Proj. 1710)
(AD-A044001; AFHRL-TR-77-31) Avail: NTIS HC A05/MF A01 CSCL 01/3

This report documents a study of the user acceptance and usability of the technical data developed under the C-141 Job Guide Technical Order (TO) Program. Step-by-step, illustrated technical orders, called job guides, were developed to replace the original TOs on the C-141 aircraft. Job guides are characterized by detailed, fully proceduralized task instruction which are keyed to illustrations which identify each component and its location. Other features include a small handbook size, standardized verb usage, simplified writing style, job preparation instructions, identification of tools and parts required, and little or no referencing to other TOs. In this first large-scale application of the job guide concept, the following positive and negative factors affecting usability and user acceptance were identified using questionnaires, interviews and observation. Positive Factors included: small size; ease of reading and understanding good illustrations keyed to procedures; job preparation information; and information acceptable to both experienced and inexperienced technicians. Negative Factors included: too many volumes required for some task sequences; errors in the data; inability to locate information quickly; storage problems; and torn and lost pages. Although problems existed, the C-141 job guides are considered to be very usable and well-accepted. It is obvious that the development of the data and the implementation of the data are two very critical factors in the success of the job guide concept.
Author (GRA)

N78-10005# Advisory Group for Aerospace Research and Development, Paris (France).
SELECTED PAPERS ON ADVANCED DESIGN OF AIR VEHICLES
Antonio Ferri Aug. 1977 133 p refs
(AGARD-AG-226; ISBN-92-835-1253-7) Avail: NTIS HC A07/MF A01

Research and Development on SST project in the U.S.A. are presented. Engine design, air pollution, and aerodynamic drag

are emphasized. For individual titles, see N78-10006 through N78-10015.

N78-10006*# Advisory Group for Aerospace Research and Development, Paris (France).
POSSIBILITIES AND GOALS FOR THE FUTURE SST c05
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 3-12 refs Repr. from J. Aircraft, v. 12, no. 12, Dec. 1975 p 919-929 Presented at 13th AIAA Aerospace Sci. Meeting, Pasadena, Calif., 20-22 Jan. 1975 (For availability see N78-10005 01-01)
(Grants NGL-33-016-119; NGR-33-016-131)
(AIAA-Paper-75-254) Avail: NTIS HC A07/MF A01 CSCL 01C

An analysis and evaluation of the social value of the SST project are presented. It is emphasized that the means of civil mass transportation reaching the same range available to military decrease the tension among neighboring nations and reduce human fatigue. The present status of the SST in the United States, together with the future goals, are described. I.M.

N78-10007*# Advisory Group for Aerospace Research and Development, Paris (France).
REVIEW OF PROBLEMS IN APPLICATION OF SUPERSONIC COMBUSTION c07
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 13-30 refs Repr. from J. Roy. Aeronaut. Soc. (Engl.), v. 68, no. 645, Sep. 1964 p 575-595 (For availability see N78-10005 01-01)
(Contracts NAS8-2686; AF 49(638)-991; AF 33(657)-10463)
Avail: NTIS HC A07/MF A01 CSCL 21B

The problem of air-breathing engines capable of flying at very high Mach numbers is described briefly. Possible performance of supersonic combustion ramjets is outlined briefly and the supersonic combustion process is described. Two mechanisms of combustion are outlined: one is supersonic combustion controlled by convection process, and the second is controlled by diffusion. The parameters related to the combustion process are discussed in detail. Data and analyses of reaction rates and mixing phenomena are represented; the flame mechanism is discussed, and experimental results are presented. Author

N78-10008# Advisory Group for Aerospace Research and Development, Paris (France).
A CRITICAL REVIEW OF HETEROGENEOUS MIXING PROBLEMS c34
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 31-41 refs Repr. from Astronaut. Acta (Austria), v. 13, nos. 5-6, 49681 p 453-465 Presented at Intern. Acad. of Astronautics Symp. on Fluid Dyn. of Heterogeneous Multi-Phase Continuous Media, Naples, 3-6 Oct. 1966 (For availability see N78-10005 01-01)
(Contract AF 33(615)-2215; AF Proj. 7064)
Avail: NTIS HC A07/MF A01

A critical review of available analyses of mixing phenomena is presented. The limitations of the assumption of the boundary layer types of approximation in the analysis of mixing and of viscous flows at high Mach numbers are discussed. Methods of analysis are described where the shortcomings introduced by any boundary layer type of approximation are avoided. The application of such type of analysis to supersonic mixing problems which produce large pressure variation, and to low density hypersonic flow is outlined. The problem of obtaining information on transport properties from experimental measures is discussed. The difficulties of producing, experimentally, a well-defined turbulent mixing of two streams, especially at low speed, are pointed out. It is shown that small pressure gradients usually present in any experiment of mixing produces strong effects on the velocity profiles of axially symmetric jets where focusing of waves is possible. New types of phenomena occurring in mixing in the presence of pressure gradients and chemical reaction are discussed. Formation of reverse flow in axially symmetric streams far from the axis of mixing, due to small pressure gradients, when mixing with combustion takes place is demonstrated analytically and experimentally. Author

N78-10009# Advisory Group for Aerospace Research and Development, Paris (France).
ANALYSIS OF FLUID DYNAMICS OF SUPERSONIC COMBUSTION PROCESS CONTROLLED BY MIXING c07
Antonio Ferri and Herbert Fox *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 43-49 refs Presented at 12th Intern. Symp. on Combust. p 1105-1112 (For availability see N78-10005 01-01)
(Contract F33615-68-C-1114)
Avail: NTIS HC A07/MF A01

The fluid dynamics of supersonic combustion is discussed. The interference between the combustion process and the supersonic flow secondary to the combustion region is described. Multiple injector flow fields are described from the point of view of mixing and of interaction with the external flow. It is shown that the selection of injector location and combustion process can be utilized to produce compression waves of controlled strength. Such waves can be utilized to reduce the flow Mach number in front of subsequent injectors. This effect is called thermal compression. Engineering criteria for utilization of thermal compression are presented. An example of such utilization is described. The example indicates that the interaction between combustion and geometry is of primary importance for the fluid-dynamic process. The effect of this interaction cannot be accounted for by a simple one-dimensional analysis. Only a judicious combination of mixing analyses and more complex analyses, that takes into account the formation and propagation of the waves due to combustion, can give detailed qualitative information on the fluid dynamics of supersonic combustion. Author

N78-10010*# Advisory Group for Aerospace Research and Development, Paris (France).
EFFECTS OF LENGTHWISE LIFT DISTRIBUTION ON SONIC BOOM OF SST CONFIGURATIONS c02
Antonio Ferri and Ahmed Ismail *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 51-54 refs Repr. from J. Aircraft, v. 12, no. 12, Dec. 1975 p 919-929 (For availability see N78-10005 01-01)
(Grant NGR-33-016-119)
Avail: NTIS HC A07/MF A01 CSCL 20A

Sonic Boom signatures produced by possible SST configurations during cruise were investigated. It is shown that optimization based on a far field analysis is not necessarily the optimum for these conditions. For an airplane length of 300 ft, near-field effects can be obtained when sufficient lift is generated near the nose of the airplane. Because of the near-field effects, sonic booms with maximum overpressures of the order of 1 lb/square foot can be obtained with possible airplane configurations having the same flight conditions at cruise. Author

N78-10011*# Advisory Group for Aerospace Research and Development, Paris (France).
PRACTICAL ASPECTS OF SONIC BOOM PROBLEMS c02
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 55-63 refs Presented at 7th Congr. of the Intern. Council of the Aeronautical Sci., Consiglio Nazl. delle Ricerche, Rome, 14-18 Sep. 1970 (For availability see N78-10005 01-01)
(Grant NGL-33-016-119)
(ICAS-Paper-70-23) Avail: NTIS HC A07/MF A01 CSCL 20A

SST configurations selected from the point of minimizing sonic booms are investigated. It is indicated that for a total length of 300 ft and total initial weight of the same order as the present U.S. SST designs, sonic booms having shock pressure rise of the order of 0.6 lb/square foot can be obtained. Values as low as 0.3 are possible for airplanes designed for cross-country flights. Author

N78-10012*# Advisory Group for Aerospace Research and Development, Paris (France).
SONIC BOOM ANALYSIS FOR HIGH-ALTITUDE FLIGHT AT HIGH MACH NUMBER c02
Antonio Ferri, Michael Siclari, and Lu Ting *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 65-74 refs Repr. from Progr. Astronaut. Aeronaut., v. 38, 1975 p 301-320 Presented at AIAA Aero-Acoustics Conf., Seattle, 15-17 Oct. 1973 (For availability see N78-10005 01-01)
(Grant NGL-33-016-119)

(AIAA-Paper-73-1034) Avail: NTIS HC A02/MF A01 CSCL 20A

Numerical programs for the computation of the flow field from the airplane at the flight altitude to the ground are presented. They take into account the nonlinear effects of high Mach number, the entropy change across the shock, the entropy and enthalpy variations in the atmospheric layer, and the gravitational effect. Extension of the programs for the axisymmetric problems to handle nonaxisymmetric terms is described. The asymmetry can be caused by the geometry of the body and the lift, and also by the fact that the variations in the atmospheric layer are two-dimensional. Numerical results for ground level signatures of several configurations at various flight conditions are presented and compared with existing approximate theories to demonstrate the influences of these nonlinear effects. Author

N78-10013# Advisory Group for Aerospace Research and Development, Paris (France).

BETTER MARKS ON POLLUTION FOR THE SST **c45**

Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 75-78 Repr. from J. Aircraft, v. 12, no. 12, Dec. 1975 p 919-929 (For availability see N78-10005 01-01)

Avail: NTIS HC A02/MF A01

The SST engine was investigated in terms of acceptable levels of nitrogen oxides and appropriate specifications for engine design, as in other pollution problems. It was found that neither the SST nor other aircraft using conventional chemical fuel will harm the upper atmosphere by water injection, and propulsion stratagems can reduce the figure of oxides of nitrogen from the 400 parts per million in exhaust used two years ago to 1 or 2 parts through the technology possible now. Author

N78-10014*# Advisory Group for Aerospace Research and Development, Paris (France).

THE JET ENGINE DESIGN THAT CAN DRASTICALLY REDUCE OXIDES OF NITROGEN **c07**

Antonio Ferri and Anthony Agnone *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 79-88 refs Presented at 12th AIAA Aerospace Sci. Meeting, Wash., D. C., 30 Jan. - 1 Feb. 1974 (For availability see N78-10005 01-01)

(Grant NGR-33-016-131)

(AIAA-Paper-74-160) Avail: NTIS HC A07/MF A01 CSCL 21E

The NOx pollution problem of hydrogen fueled turbojets and supersonic combustion ramjets (scramjets) was investigated to determine means of substantially alleviating the problem. Since the NOx reaction rates are much slower than the energy producing reactions, the NOx production depends mainly on the maximum local temperatures in the combustor and the NOx concentration is far from equilibrium at the end of a typical combustor (L approximately 1 ft). In diffusion flames, as used in present turbojets and scramjets combustor designs, the maximum local temperature occurs at the flame and is equal to the stoichiometric value. Whereas, in the heat conduction flames, wherein the flame propagates due to a heat conduction process away from the flame to the cooler oncoming premixed unburnt gases, the maximum temperature is lower than in the diffusion flame. Hence the corresponding pollution index is also lower. Author

N78-10015*# Advisory Group for Aerospace Research and Development, Paris (France).

THE PROBLEM OF POLLUTION FOR THE SST **c45**

Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 89-96 refs Presented at the 9th Congr. of the Intern. Council of the Aeron. Sci., Haifa, Israel 25-30 Aug. 1974 (For availability see N78-10005 01-01)

(Grant NGR-33-016-131)

(ICAS-Paper-74-29) Avail: NTIS HC A07/MF A01 CSCL 21E

A qualitative review of the possible effects of the exhaust gases discharged by a large fleet of SST's in the upper atmosphere is given. The review indicates the importance of the NO production in the exhaust gases. The mechanism of NO formation by the combustion process is described. A method for reduction of the NO formation is presented. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N78-10016 Polish Academy of Sciences, Warsaw.

AERODYNAMIC INTERFERENCE IN A SYSTEM OF TWO HARMONICALLY OSCILLATING AIRFOILS AND ITS INFLUENCE ON FLUTTER [INTERFERENCJA AERODYNAMICZNA W UKLADZIE DWOCH HARMONICZNIE OSCYLUJACYCH PROFILI I JEJ WPLYW NA FLATTER]

Janusz Grzedzinski 21 Jan. 1977 113 p refs In POLISH

Avail: Issuing Activity

A two-dimensional model which can provide a determination of the critical flutter speed in a system of two mutually interracting airfoils was employed. The basic characteristic of interference was taken into account, namely, the effect of whirling wakes arising behind the airfoils. Results of various experiments are presented, namely: (1) the occurrence of flutter caused only by aerodynamic interference between the wing and the vertical stabilizer was observed; (2) the flutter disappears when the stabilizer is placed near the plane of the wing; and (3) a monotonic fall in the speed of flutter was observed when the wings in a biplane system were brought close together. A verification of these observations is provided within the framework of the two-dimensional model described above. Author

N78-10017*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.

UNSTEADY AERODYNAMIC MODELING AND ACTIVE AEROELASTIC CONTROL

John William Edwards Feb. 1977 207 p refs

(Grant NGL-05-020-007)

(NASA-CR-148019; SUDAAR-504) Avail: NTIS HC A10/MF A01 CSCL 01A

Unsteady aerodynamic modeling techniques are developed and applied to the study of active control of elastic vehicles. The problem of active control of a supercritical flutter mode poses a definite design goal stability, and is treated in detail. The transfer functions relating the arbitrary airfoil motions to the airloads are derived from the Laplace transforms of the linearized airload expressions for incompressible two dimensional flow. The transfer function relating the motions to the circulatory part of these loads is recognized as the Theodorsen function extended to complex values of reduced frequency, and is termed the generalized Theodorsen function. Inversion of the Laplace transforms yields exact transient airloads and airfoil motions. Exact root loci of aeroelastic modes are calculated, providing quantitative information regarding subcritical and supercritical flutter conditions. Author

N78-10018*# Raven Industries, Inc., Sioux Falls, S. Dak.

TETROON EVALUATION PROGRAM Final Report

J. D. Beemer and T. W. Markhardt Apr. 1977 39 p refs

(Contract NAS8-32135)

(NASA-CR-150437) Avail: NTIS HC A03/MF A01 CSCL 01A

The actual volume of a constant volume superpressured tetrahedron shaped balloon changes as the amount of superpressure is changed. The experimental methods used to measure these changes in volume are described and results are presented. The basic equations used to determine the amount of inflation gas required for a tetroon to float at a predetermined flight level are presented and inflation techniques discussed. Author

N78-10019*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LOW SPEED AERODYNAMIC CHARACTERISTICS OF AN 0.075-SCALE F-15 AIRPLANE MODEL AT HIGH ANGLES OF ATTACK AND SIDESLIP

Daniel N. Petroff, Stanley H. Scher, and Lee E. Cohen (ARO, Inc., Moffett Field, Calif.) Jul. 1974 118 p refs

(NASA-TM-X-62360) Avail: NTIS HC A06/MF A01 CSCL 01A

An 0.075 scale model representative of the F-15 airplane was tested in the Ames 12 foot pressure wind tunnel at a Mach number of 0.16 to determine static longitudinal and lateral directional characteristics at spin attitudes for Reynolds numbers from 1.48 to 16.4 million per meter (0.45 to 5.0 million per foot). Angles of attack ranged from 0 to +90 deg and from -40 deg to -80 deg while angles of sideslip were varied from -20 deg to +30 deg. Data were obtained for nacelle inlet ramp angles of 0 to 11 deg with the left and right stabilators deflected 0, -25 deg, and differentially 5 deg and -5 deg. The normal pointed nose and two alternate nose shapes were also tested along with several configurations of external stores. Analysis of the results indicate that at higher Reynolds numbers there is a slightly greater tendency to spin inverted than at lower Reynolds numbers. Use of a hemispherical nose in place of the normal pointed nose provided an over correction in simulating yawing moment effects at high Reynolds numbers. Author

N78-10020*# Boeing Vertol Co., Philadelphia, Pa.
WIND TUNNEL INVESTIGATION OF ROTOR LIFT AND PROPULSIVE FORCE AT HIGH SPEED: DATA ANALYSIS
Frank McHugh, Ross Clark, and Mary Soloman Oct. 1977 211 p 3 Vol.
(Contract NAS1-14317)
(NASA-CR-145217-App-1; D210-11135-1) Avail: NTIS HC A10/MF A01 CSCL 01A

The basic test data obtained during the lift-propulsive force limit wind tunnel test conducted on a scale model CH-47b rotor are analyzed. Included are the rotor control positions, blade loads and six components of rotor force and moment, corrected for hub tares. Performance and blade loads are presented as the rotor lift limit is approached at fixed levels of rotor propulsive force coefficients and rotor tip speeds. Performance and blade load trends are documented for fixed levels of rotor lift coefficient as propulsive force is increased to the maximum obtainable by the model rotor. Test data is also included that defines the effect of stall proximity on rotor control power. The basic test data plots are presented in volumes 2 and 3. Author

N78-10021*# Boeing Vertol Co., Philadelphia, Pa.
WIND TUNNEL INVESTIGATION OF ROTOR LIFT AND PROPULSIVE FORCE AT HIGH SPEED. TEST DATA APPENDIX
Frank McHugh, Ross Clark, and Mary Soloman Oct. 1977 607 p 3 Vol.
(Contract NAS1-14317)
(NASA-CR-145217-App-2; D210-11135-2) Avail: NTIS HC A99/MF A01 CSCL 01A
For abstract, see N78-10020.

N78-10022*# Boeing Vertol Co., Philadelphia, Pa.
WIND TUNNEL INVESTIGATION OF ROTOR LIFT AND PROPULSIVE FORCE AT HIGH SPEED: TEST DATA APPENDIX
Frank McHugh, Ross Clark, and Mary Soloman Oct. 1977 360 p 3 Vol.
(Contract NAS1-14317)
(NASA-CR-145217-App-3; D210-11135-3-App) Avail: NTIS HC A16/MF A01 CSCL 01A
For abstract, see N78-10020.

N78-10023*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN EXPLORATORY INVESTIGATION OF THE EFFECTS OF A THIN PLASTIC FILM COVER ON THE PROFILE DRAG OF AN AIRCRAFT WING PANEL
William D. Beasley and Robert J. McGhee Oct. 1977 17 p refs
(NASA-TM-74073) Avail: NTIS HC A02/MF A01 CSCL 01A

Exploratory wind tunnel tests were conducted on a large chord aircraft wing panel to evaluate the potential for drag reduction resulting from the application of a thin plastic film cover. The tests were conducted at a Mach number of 0.15 over a Reynolds number range from about 7 x 10 to the 6th power to 63 x 10 to the 6th power. Author

N78-10024# AeroVironment, Inc., Pasadena, Calif.
AIRCRAFT VORTEX WAKE DECAY NEAR THE GROUND Final Report, Jun. 1975 - Sep. 1976
I. Tombach, P. B. S. Lissaman, J. B. Mullen, and S. J. Barker (Poseidon Res.) May 1977 162 p refs
(Contract DOT-TSC-1008)
(AD-A042478/8; DOT-TSC-FAA-77-8; FAA-RD-77-46; AV-FR-668) Avail: NTIS HC A08/MF A01 CSCL 20D

A multifaceted experimental and analytical research program was carried out to explore the details of aircraft wake vortex breakdown under conditions representative to those which would prevail at low altitudes in the vicinity of airports. Numerous separate approaches were taken simultaneously. Flight tests with Lockheed L-18 Lodestar and Boeing 747 aircraft flying over ground based instrumentation provided data on overall vortex behavior, on the vortex ages at the time of onset of instabilities, and on the changes in the vortex velocity fields which resulted from vortex breakdowns. Analytical work on stability theories identified conditions under which vortices could undergo unstable decay. Experimental tests in a water tank looked at the internal instability of vortices, and also shed light on vortex motion near the ground. Finally, a heuristic modeling approach resulted in a simple representation of the relationship between the times of vortex breakdowns and the ambient turbulence levels. Although a detailed mechanism for vortex breakdowns was not found, a universal function, usable for all aircraft, was developed for predicting vortex breakdown times within a factor of two error. Author

N78-10025*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF CANARD LOCATION ON THE AERODYNAMIC CHARACTERISTICS OF A SHARP-NOSED MISSILE AT MACH NUMBERS OF 1.5 AND 2.0
Donald L. Kassner and Brian Wettlaufer (ARO, Inc., Moffett Field, Calif.) Sep. 1977 663 p refs
(NASA-TM-73221; A-6959) Avail: NTIS HC A99/MF A01 CSCL 01A

A sharp-nosed missile model with nose-mounted canards and cruciform tail surfaces was tested in the Ames 6- by 6-foot wind tunnel to determine the contributions of the component aerodynamic surfaces on the static aerodynamic characteristics at Mach numbers of 1.5 and 2.0 and a Reynolds number of 1,000,000 based on body diameter. Effect of canard location (at three different axial positions) was investigaed. Data were obtained at angles of attack ranging from 3 deg to 12 deg, roll angles of 0 deg and 45 deg, and canard-deflection angles from 3 deg to 15 deg for various stages of model build-up (i.e., with and without canard and/or tail surfaces). The canard in the most aft position was least effective in trimming the model. With movement of the canard to the most forward position, the model was trimmable at angles of attack up to about 5 deg or 6 deg with panel deflections of 9 deg. Author

N78-10026*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ATMOSPHERIC EFFECTS ON INLETS FOR SUPERSONIC CRUISE AIRCRAFT
Gary L. Cole 1977 14 p refs Presented at 13th Prop. Conf., Orlando, Fla., 11-13 Jul. 1977; sponsored by AIAA and Soc. of Automotive Engr.
(NASA-TM-X-73647; E-9154) Avail: NTIS HC A02/MF A01 CSCL 01A

Mixed-compression inlet dynamic behavior in the vicinity of unstart, was simulated and analyzed to investigate time response of an inlet's normal shock to independent disturbances in ambient temperature and pressure and relative velocity (longitudinal gust), with and without inlet controls active. The results indicate that atmospheric disturbances may be more important than internal disturbances in setting inlet controls requirements because they are usually not anticipated and because normal shock response to rapid atmospheric disturbances is not attenuated by the inlet, as it is for engine induced disturbances. However, before inlet control requirements can be fully assessed, more statistics on extreme atmospheric disturbances are needed. Author

N78-10027*# Boeing Commercial Airplane Co., Seattle, Wash.
SPLINED VERSION OF FLEXSTAB: A CRITICAL ANALYSIS OF ALTERNATE SCHEMES Final Report
J. A. Weber Aug. 1977 47 p refs

(Contract NAS2-7729)
(NASA-CR-152030) Avail: NTIS HC A03/MF A01 CSCL 01A

Recommendations are made for improved aerodynamic models and numerical schemes to be considered for inclusion into the FLEXSTAB computer program system. These recommendations are based on a critical analysis of numerical technology. Author

N78-10028*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND-TUNNEL PRESSURE DATA AT MACH NUMBERS FROM 1.6 TO 4.63 FOR A SERIES OF BODIES OF REVOLUTION AT ANGLES OF ATTACK FROM -4 DEG TO 60 DEG
Emma Jean Landrum Washington Oct. 1977 151 p
(NASA-TM-X-3558; L-11629) Avail: NTIS HC A08/MF A01 CSCL 01A

The tabulated results of wind tunnel pressure tests are presented without analysis. The data were obtained for a series of six bodies of revolution at Mach numbers of 1.6, 2.3, 2.96, and 4.63 for angles of attack from -4 deg to 60 deg. The Reynolds number used for these tests was 6.6 x 1 million per meter. Author

N78-10029*# Computational Mechanics Consultants, Knoxville, Tenn.
FINITE ELEMENT ANALYSIS OF LOW SPEED VISCOUS AND INVISCID AERODYNAMIC FLOWS Final Report
A. J. Baker and P. D. Manhardt Washington NASA Oct. 1977 90 p refs
(Contract NAS1-14024)
(NASA-CR-2908; CoMoC-77TR-2) Avail: NTIS HC A05/MF A01 CSCL 01A

A weak interaction solution algorithm was established for aerodynamic flow about an isolated airfoil. Finite element numerical methodology was applied to solution of each of differential equations governing potential flow, and viscous and turbulent boundary layer and wake flow downstream of the sharp trailing edge. The algorithm accounts for computed viscous displacement effects on the potential flow. Closure for turbulence was accomplished using both first and second order models. The COMOC finite element fluid mechanics computer program was modified to solve the identified equation systems for two dimensional flows. A numerical program was completed to determine factors affecting solution accuracy, convergence and stability for the combined potential, boundary layer, and parabolic Navier-Stokes equation systems. Good accuracy and convergence are demonstrated. Each solution is obtained within the identical finite element framework of COMOC. Author

N78-10030*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF A SIMULATED ENGINE JET BLOWING ABOVE AN ARROW WING AT MACH 2.0
Barrett L. Shrout and Clyde Hayes 1977 56 p refs
(NASA-TP-1050; L-11751) Avail: NTIS HC A04/MF A01 CSCL 01A

The effects of a gas jet simulating a turbojet engine exhaust blowing above a cambered and twisted arrow wing were investigated. Tests were conducted in the Langley 4-foot supersonic pressure tunnel at a Mach number of 2.0. Nozzle pressure ratios from 1 to 64 were tested with both helium and air used as jet gases. The tests were conducted at angles of attack from -2 deg to 8 deg at a Reynolds number of 9,840,000 per meter. Only the forces and moments on the wing were measured. Results of the investigation indicated that the jet blowing over the wing caused reductions in maximum lift-drag ratio of about 4 percent for helium and 6 percent for air at their respective design nozzle pressure ratios, relative to jet-off data. Moderate changes in the longitudinal, vertical, or angular positions of the jet relative to the wing had little effect on the wing aerodynamic characteristics. Author

N78-10031# California Inst. of Tech., Pasadena.
SURFACE ROUGHNESS EFFECTS ON THE HYPERSONIC TURBULENT BOUNDARY LAYER Final Report, 1 Feb. 1974 - 31 Jan. 1976
Toshi Kubota and Dale E. Berg Jun. 1977 115 p refs
(Contract DAHC04-74-C-0009)
(AD-A042141; ARO-12397.1-E) Avail: NTIS HC A06/MF A01 CSCL 20/4

An experimental investigation of the response of a hypersonic turbulent boundary layer to a step change in surface roughness has been performed. The boundary layer on a flat nozzle wall of a Mach 6 wind tunnel was subjected to abrupt changes in surface roughness and its adjustment to the new surface conditions was examined. Both mean and fluctuating flow properties were acquired for smooth-to-rough and rough-to-smooth surface configurations. Author (GRA)

N78-10032# Raven Industries, Inc., Sioux Falls, S. Dak.
PHASE 1 OF A PROGRAM TO DESIGN AND TEST A BALLOON SYSTEM FOR SHIPBOARD LAUNCH
K. L. TeKrony 11 Jul. 1977 28 p
(Contract N00014-77-C-0170)
(AD-A042512; R-0777002) Avail: NTIS HC A03/MF A01 CSCL 01/3

The purpose of the program is to develop a balloon system which can be launched from the deck of a ship, by inexperienced personnel, and will support a 15.0 lb. payload at an altitude of 70,000 feet for a duration of 4-12 hours. The balloon system must be rugged enough to permit reliable deployment in wind velocities up to 45 knots. GRA

N78-10033# ARO, Inc., Arnold Air Force Station, Tenn.
CRITICAL STING LENGTH AS DETERMINED BY THE MEASUREMENT OF PITCH-DAMPING DERIVATIVES FOR LAMINAR, TRANSITIONAL, AND TURBULENT BOUNDARY LAYERS AT MACH NO. 3 FOR REDUCED FREQUENCIES OF 0.0033 AND 0.0056 Final Report, 1 Jul. 1975 - 17 Apr. 1977
Bob L. Uselton and Fred B. Cyran AEDC Jul. 1977 67 p refs
(ARO Proj. V32A04A; ARO Proj. V41A-J0A; ARO Proj. V32A-A1A; ARO Proj. V41A-N9A)
(AD-A042747; ARO-VKF-TR-77-35; AEDC-TR-77-66) Avail: NTIS HC A04/MF A01 CSCL 20/4

Support interference in supersonic wind tunnels is studied. The critical sting length at alpha = 0 was determined by the measurement of pitch-damping derivatives for laminar, transitional, and turbulent boundary layers at the model base. The effect of wedge splitter plates on sting interference was also investigated. By utilizing the small amplitude forced oscillation technique, data were obtained at Mach number 3 on a blunt 7 deg cone for reduced frequencies of 0.0033 and 0.0056. Model base pressure and a model surface pressure near the base were measured tin addition to the pitch damping derivatives. The results showed that the critical sting length with respect to sting interference on pitch-damping data was two model diameters for the two reduced frequencies investigated and was independent of the type of boundary layer at the model base. The critical sting length for minimal base pressure interference is 2.5 model diameters for this model and these test conditions. GRA

N78-10010*# Advisory Group for Aerospace Research and Development, Paris (France).
EFFECTS OF LENGTHWISE LIFT DISTRIBUTION ON SONIC BOOM OF SST CONFIGURATIONS
Antonio Ferri and Ahmed Ismail *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 51-54 refs Repr. from J. Aircraft, v. 12, no. 12, Dec. 1975 p 919-929
(For availability see N78-10005 01-01)
(Grant NGR-33-016-119)
Avail: NTIS HC A07/MF A01 CSCL 20A

N78-10011*# Advisory Group for Aerospace Research and Development, Paris (France).
PRACTICAL ASPECTS OF SONIC BOOM PROBLEMS
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 55-63 refs Presented at 7th Congr. of the Intern. Council of the Aeronautical Sci., Consiglio Nazl. delle Ricerche, Rome, 14-18 Sep. 1970 (For availability see N78-10005 01-01)
(Grant NGL-33-016-119)

(ICAS-Paper-70-23) Avail: NTIS HC A07/MF A01 CSCL 20A

N78-10012*# Advisory Group for Aerospace Research and Development, Paris (France).
SONIC BOOM ANALYSIS FOR HIGH-ALTITUDE FLIGHT AT HIGH MACH NUMBER
Antonio Ferri, Michael Siclari, and Lu Ting *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 65-74 refs Repr. from Progr. Astronaut. Aeronaut., v. 38, 1975 p 301-320 Presented at AIAA Aero-Acoustics Conf., Seattle, 15-17 Oct. 1973 (For availability see N78-10005 01-01)
(Grant NGL-33-016-119)
(AIAA-Paper-73-1034) Avail: NTIS HC A02/MF A01 CSCL 20A

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N78-10034*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LIGHT AIRPLANE CRASH TESTS AT IMPACT VELOCITIES OF 13 AND 27 m/sec
Emilio Alfaro-Bou and Victor L. Vaughan, Jr. Nov. 1977 52 p refs
(NASA-TP-1042; L-11426) Avail: NTIS HC A04/MF A01 CSCL 01C

Two similar general aviation airplanes were crash tested at the Langley impact dynamics research facility at velocities of 13 and 27 m/sec. Other flight parameters were held constant. The facility, instrumentation, test specimens, and test method are briefly described. Structural damage and accelerometer data are discussed. Author

N78-10035*# Douglas Aircraft Co., Inc., Long Beach, Calif.
COST/BENEFIT TRADEOFFS FOR REDUCING THE ENERGY CONSUMPTION OF THE COMMERCIAL AIR TRANSPORTATION SYSTEM Summary Report, 5 Nov. 1974 - 30 Jun. 1976
E. F. Kraus and J. C. VanAbkoude Jun. 1976 77 p
(Contract NAS2-8618)
(NASA-CR-137925; MDC-J7340) Avail: NTIS HC A05/MF A01 CSCL 05C

The fuel saving potential and cost effectiveness of numerous operational and technical options proposed for reducing the fuel consumption of the U.S. commercial airline fleet was examined and compared. The impact of the most promising fuel conserving options on fuel consumption, passenger demand, operating costs and airline profits when implemented in the U.S. domestic and international airline fleets was determined. A forecast estimate was made of the potential fuel savings achievable in the U.S. scheduled air transportation system. Specifically, the means for reducing the jet fuel consumption of the U.S. scheduled airlines in domestic and international passenger operations were investigated. A design analysis was made of two turboprop aircraft as possible fuel conserving derivatives of the DC-9-30. Author

N78-10036# Civil Aeromedical Inst., Oklahoma City, Okla.
EMERGENCY ESCAPE OF HANDICAPPED AIR TRAVELERS
J. G. Blethrow, J. D. Garner, D. L. Lowrey, D. E. Busby, and R. F. Chandler Jul. 1977 72 p refs
(AD-A043269/0; FAA-AM-77-11) Avail: NTIS HC A04/MF A01 CSCL 06/7

A study is conducted to investigate potential problems related to the emergency evacuation of civil aircraft carrying handicapped passengers. An analysis of the movement of individual handicapped subjects in an aircraft cabin is included along with the results of evacuation tests in which a portion of the test subjects either were handicapped or simulated handicaps. Data are given relative to assistance to handicapped passengers, the effects of groups of handicapped passengers, seating location, floor slope, and exit type on the evacuation time. Suggestions by handicapped subjects and a summary of recent aircraft accidents involving evacuation of handicapped passengers are included as appendices to the report. Author

N78-10037# Boeing Commercial Airplane Co., Seattle, Wash.
AIRCRAFT ALERTING SYSTEMS CRITERIA STUDY. VOLUME 1: COLLATION AND ANALYSIS OF AIRCRAFT ALERTING SYSTEM DATA Final Report, Jan. - Nov. 1976
J. E. Veitengruber, G. P. Boucek, Jr., and W. D. Smith May 1977 288 p refs
(Contract DOT-FA73WA-3233)
(AD-A042328/5; FAA-RD-76-222-Vol-1) Avail: NTIS HC A13/MF A01 CSCL 01/4

Studies, performed to develop optimum alerting methods for new alerts that had to be retrofitted to existing aircraft identified as major alerting system problems the proliferation of aleting systems and the inconsistent application of alerting concepts in current commercial transport aircraft. These problem areas were addressed in the following manner: (1) refine and augment the stimuli response data collected, (2) provide test plans for additional stimuli response tests, (3) provide tabulations of the alerting methods and alerting requirements used on current commercial transport aircraft, (4) develop a method for prioritizing alerting functions and the alerting functions accordingly, (5) note conflicts between current alerting requirements and the prioritized list of alerts, and (6) provide recommendations for standardization of alerting functions/methods. A collation of human factors data pertinent to alerting systems is included, plus cursory test plans for obtaining missing human factors data required to complete definition of and validate the standards recommended for alerting systems, criteria for alert priority levels, an example tabulation of alerts that might fall within each priority level, and recommended methods of annunciating the alerts within each priority level.
Author

N78-10038# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
CREW ESCAPE CAPSULE RETROROCKET CONCEPT. VOLUME 1: DEMONSTRATION PROGRAM Final Technical Report, May 1972 - Oct. 1975
Marvin C. Whitney May 1977 78 p refs 2 Vol.
(AF Proj. 6065)
(AD-A042337; AFFDL-TR-76-107-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 01/2

The retrorocket demonstration program was conducted to evaluate an alternative to the inflatable airbags that are currently used with crew escape capsules to attenuate the landing impact forces. In-house tests indicated that if the vertical impact velocity was ten feet per second or less, the impact forces would be within human tolerances. Analyses revealed that the retrorocket concept could meet this criteria, therefore, a demonstration test program was established. A structural steel test vehicle that was configured to simulate the B-1 capsule (weight, center of gravity location, footprint, size and parachute bridle system) was used for the test program. A cluster of four rocket motors with a high level primary thrust and a low level sustainer, that had been developed for the NASA Gemini Program, was installed at the confluence of the three 69.8 foot diameter slotted ring sail recovery chutes and the vehicle bridle system. A mechanical altimeter or telescoping probe was developed to extend down below the vehicle to trigger the rocket ignition at the correct time so as to decelerate the vehicle from 30 ft/sec down to 10 ft/sec or less before ground impact. Eight tests were conducted in developing the demonstration system with the last test a complete retrorocket system test. Test results and the rocket performance computer program indicated the demonstration program met design requirements. Author (GRA)

N78-10039# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
CREW ESCAPE CAPSULE RETROROCKET CONCEPT. VOLUME 2: SELECTION OF A RETROROCKET SYSTEM Final Technical Report, May 1972 - Oct. 1975
James M. Peters May 1977 76 p refs 2 Vol.
(AF Proj. 6065)

(AD-A042218; AFFDL-TR-76-107-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 21/8

The objective of this analysis was to select a rocket design which would decelerate a B-1 escape capsule drop test vehicle to a vertical velocity of 10 ft/sec or less at capsule impact with the terrain. The concept is based on the prediction that if the capsule is decelerated to a vertical velocity of 10 ft/sec or less at impact, the capsule occupants would not be subjected to accelerations which exceed the requirements of MIL-C-25969B. The results of a parametric study which considered thrust to weight ratios of 2 through 10, in combination with recovery system descent rates of 30 through 60 ft/sec, are presented. The test envelopes which could be accommodated with two different off-the-shelf rocket systems are presented. The analytical method employed in determining the test envelopes is discussed. Performance summaries for the selected rocket system are given. Author (GRA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N78-10040# Systems Control, Inc., Palo Alto, Calif.
AN OPERATIONAL EVALUATION OF FLIGHT TECHNICAL ERROR Final Report
R. J. Adams Jul. 1975 358 p refs
(Contract DOT-FA72WA-3098)
(AD-A042796/3; FAA-RD-76-33) Avail: NTIS HC A16/MF A01 CSCL 17/7

Controlled cockpit simulator and flight test experiments were conducted to determine whether a one mile flight technical error (FTE) is achievable in enroute and terminal area operations using various types of RNAV equipment. The magnitude of FTE and its impact on airspace planning, RNAV system manufacturers, RNAV users and air traffic controllers is analyzed taking into account the following: RNAV equipment and display factors, FTE performance in turns, performance in parallel offset, delay fan and direct to maneuvers, effects of workload and airspace utilization. RNAV error budget element combination is also analyzed. The currently used RSS technique is compared to a modified version of this computation which is more accurate in predicting the total system cross track error. Data from the controlled cockpit simulator tests, airline type RNAV system tests, and operational flight tests using general aviation quality RNAV systems are discussed. Author

N78-10041# National Aviation Facilities Experimental Center, Atlantic City, N. J.
A FLIGHT INVESTIGATION OF SYSTEM ACCURACIES AND OPERATIONAL CAPABILITIES OF A GENERAL AVIATION AREA NAVIGATION SYSTEM Final Report
Jack D. Edmonds, Robert H. Pursel, and John Gallagher Jun. 1977 100 p
(AD-A042846/6; FAA-NA-77-1; FAA-RD-77-43) Avail: NTIS HC A05/MF A01 CSCL 17/7

Flight tests were conducted using a general aviation area navigation (RNAV) system to investigate system accuracies and resultant airspace requirements in the terminal area. Issues investigated were total system error and error budget, flight technical error, turn anticipation, waypoint storage capacity, and results of typical operational maneuvers. Subject pilots for the test represented two distinct levels of experience. Subjects were also restricted to a one-, two-, or three-waypoint storage capacity for various flights. Statistical data are presented for the various error components making up the RNAV total system error. Various operational capabilities were also investigated and graphical data are presented for parallel offsets and turn anticipation. A two standard deviation of + or - 1.5 n.mi. was measured for total system crosstrack error in the terminal area. Author

N78-10042*# Analytical Mechanics Associates, Inc., Jericho, N.Y.
AUTOMATED LANDING, ROLLOUT, AND TURNOFF USING MLS AND MAGNETIC CABLE SENSORS Final Report
S. Pines, S. F. Schmidt, and F. Mann Washington NASA Oct. 1977 152 p refs
(Contract NAS1-14311)
(NASA-CR-2907; AMA-77-3) Avail: NTIS HC A08/MF A01 CSCL 17G

A description of the simulation program used to study the landing approach, rollout and turnoff of the B737-100 aircraft utilizing MLS and a buried magnetic leader cable as navigation aids is presented. Simulation results are given and show the concept to be both feasible and practical for commercial type aircraft terminal area control. Author

N78-10043# Army Electronics Command, Fort Huachuca, Ariz.
AN APPROACH GUIDANCE SYSTEM FOR REMOTELY-PILOTED VEHICLES
Norman K. Shupe Jul. 1977 71 p
(AD-A041561; ECOM-4503) Avail: NTIS HC A04/MF A01 CSCL 17/7

This report develops a guidance formulation with general applicability to the problem of the IFR landing of aircraft of any type; however, the formulation is specialized in this document to the case of a non-decelerating approach to the landing point. The control problem considered is the computer simulation of the automatic landing of a mini-RPV of the delta wing variety. Author (GRA)

N78-10044# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
A COMPARISON BETWEEN GROUND BASED AND AIRCRAFT BORNE TRIANGULATION OF CHEMICAL RELEASES IN THE LOWER THERMOSPHERE Interim Report
Robert G. Roper and Howard D. Edwards Apr. 1977 17 p
(Contract F19628-74-C-0085)
(AD-A042262; SR-3; AFGL-TR-77-0089) Avail: NTIS HC A02/MF A01 CSCL 04/2

Chemical release wind profiles from three rockets as measured by both ground based and aircraft borne triangulation are compared. The potential of aircraft observations as an alternative to ground based in overcast conditions is confirmed. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N78-10045*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EFFECT OF DIGITALLY COMPUTED DRIVES ON PERFORMANCE OF CONTINUOUS LINEAR SYSTEMS
Russell V. Parrish Sep. 1977 47 p refs
(NASA-TN-D-8518; L-11491) Avail: NTIS HC A03/MF A01 CSCL 01C

The dependence of the Bode response upon digital sample rate for first and second order linear continuous systems driven by a digital computer is derived. Open loop lead compensation introduced within the digital computer in order to increase the system bandwidth is also examined in terms of derived Bode responses. This introduction of lead terms within the digital computer is shown to be effective at operating frequencies below the Nyquist frequency. In most practical applications, empirical determination of these lead coefficients appears to be a sufficient compensation method. Author

N78-10046*# Boeing Vertol Co., Philadelphia, Pa.
PILOT EVALUATION OF AN ADVANCED HINGELESS ROTOR XY-15 SIMULATION
M. A. McVeigh Jun. 1977 43 p refs

(Contract NAS2-8048)
(NASA-CR-152034; D210-11255-1) Avail: NTIS HC A03/MF A01 CSCL 01C

A piloted simulation of an advanced hingeless rotor XV-15 tilt-rotor aircraft was carried out. The evaluation was made by a pilot from NASA-Ames who had previous experience flying a simulation of the current gimballed rotor NASA/Army XV-15. It was pointed out that some modifications to the force feel system were needed in order to provide rapid force trimming during rapid maneuvers. Some additional tailoring of the SCAS system was required to achieve good nap-of-the-earth performance. Overall pilot opinion on the hingeless rotor XV-15 tilt rotor was favorable. Brief discussion on the mathematical models and the simulator configuration are presented. The maneuvers and pilot comments are given along with some engineering comments.
Author

N78-10047*# Boeing Commercial Airplane Co., Seattle, Wash.
THE 737 GRAPHITE COMPOSITE FLIGHT SPOILER FLIGHT SERVICE EVALUATION Annual Report, Apr. 1976 - Apr. 1977
Robert L. Stoecklin Aug. 1977 33 p refs
(Contract NAS1-11668)
(NASA-CR-145207; AR-3) Avail: NTIS HC A03/MF A01 CSCL 01C

The flight service experience of 110 graphite epoxy spoilers on 737 transport aircraft was reviewed as well as ground based environmental exposure of graphite epoxy material specimens for the period from April 1976 through April 1977. Several spoilers were installed on each of 27 aircraft representing seven major airlines operating throughout the world. A flight service evaluation program of at least 5 years is under way. As of April 30, 1977, a total of 766,938 spoiler flight hours and 1,168,090 spoiler landings were accumulated by the fleet. Based on visual ultrasonic, and destructive testing, there was no evidence of moisture migration into the honeycomb core and no core corrosion. Tests of removed spoilers and of ground based exposure specimens after the third year of service continue to indicate modest changes in composite strength properties. Author

N78-10048*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEASUREMENT OF MODEL AEROELASTIC DEFORMATIONS IN THE WIND TUNNEL AT TRANSONIC SPEEDS USING STEREOPHOTOGRAMMETRY
Joseph D. Brooks and Jerry K. Beamish (General Dynamics Corp., Fort Worth, Tex.) 1977 43 p refs
(NASA-TP-1010; L-11092) Avail: NTIS HC A03/MF A01 CSCL 01C

A stereophotographic method of determining the aeroelastic deformations of an airplane model under aerodynamic load in the wind tunnel was evaluated. Wind tunnel tests were conducted in the Langley 8 foot transonic pressure tunnel on the wing of a 0.0625 scale model of the TF-8A supercritical wing research airplane to obtain simultaneously the aerodynamic forces and moments, pressure distributions, and stereophotographs. Tests were conducted at Mach numbers of 0.80, 0.95, and 1.20, and at free stream dynamic pressures of 20,349 Pa and 40,698 Pa. Accuracy of the stereophotographic technique in determining wing deflections was within 0.013 cm under static conditions. This value translates to an error in wing twist of 0.10 deg inboard and increases to 0.20 deg outboard. When the model was under aerodynamic load in the wind tunnel, the accuracy of the stereophotographic technique of determining wind deflections increased to 0.052 cm when compared with static wing loadings because of the dynamic motion of the model in the tunnel. Author

N78-10049*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VALIDATION OF A FLEXIBLE AIRCRAFT TAKE-OFF AND LANDING ANALYSIS (FATOLA)
Huey D. Carden and John R. McGehee 1977 68 p refs
(NASA-TP-1025; L-11704) Avail: NTIS HC A04/MF A01 CSCL 01C

Modifications to improve the analytical simulation capabilities of a multi-degree-of-freedom flexible aircraft take-off and landing analysis (FATOLA) computer program are discussed. The FATOLA program was used to simulate the landing behavior of a stiff body X-24B reentry research vehicle and of a flexible body supersonic cruise YF-12A research airplane. The analytical results were compared with flight test data, and correlations of vehicle motions, attitudes, forces, and accelerations during the landing impact and rollout were good. For the YF-12A airplane, airframe flexibility was found to be important for nose gear loading. Based upon the correlation study presented, the versatility and validity of the FATOLA program for the study of landing dynamics of aircraft are confirmed. Author

N78-10050# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
AMRL REMOTELY PILOTED VEHICLE (RPV) SYSTEM SIMULATION STUDY 5 RESULTS Summary Report
Nilss M. Aume, Robert G. Mills, Aldo A. Gillio (Dayton Univ. Res. Inst.), Gene Sebasky (IBM, Dayton, Ohio), and Dale Wartluft (IBM, Dayton, Ohio) Apr. 1977 44 p refs
(Contracts F33615-76-C-5020; F33615-75-C-5152)
(AD-A041673; AFML-TR-77-23) Avail: NTIS HC A03/MF A01 CSCL 01/3

The AMRL RPV System Simulation and Research Program was initiated in response to requirements for support of the design of the man-machine/environment interface of AF RPV systems. The major objectives of this program are as follows: Perform RPV system design evaluation studies; Assess RPV system effectiveness, i.e. evaluate the expected effectiveness of a given system configuration such as its overall probability of achieving a target, etc; Provide man-machine/environment interface engineering data; and Test bed new technology. This study included automatic RPV heading correction and position reporting smoothing functions. The study employed scenarios requiring that support RPVs, via reprogramming, provide coverage for a set of strike RPVs. GRA

N78-10051# United Technologies Corp., Stratford, Conn. Sikorsky Aircraft Div.
INVESTIGATION OF THE COMPLIANT ROTOR CONCEPT
Robert H. Blackwell Jun. 1977 116 p refs
(Contract DAAJ02-76-C-0003; DA Proj. 1F2-62209-AH-76)
(AD-A042338; SER-50985; USAAMRDL-TR-77-7) Avail: NTIS HC A06/MF A01 CSCL 01/3

An analytic investigation was conducted to determine the feasibility of improving helicopter performance and reducing flight loads by passive control of blade torsional response. Distributions of time-varying blade elastic twist that improve performance and decrease blade stress are identified. Blade design features producing the desired twisting are then sought through examination of model and full-scale torsional response data and through an analytic evaluation of significant parameters. Results indicate a significant potential for inducing 1P and 2P elastic twisting. Tip sweep on a blade of reduced torsional stiffness improves performance and reduces control loads and blade stress by inducing a 1P torsional response, which decreases advancing-blade twist and increases retreating-blade twist. Negative airfoil camber is shown to reduce blade stress but generally degrade performance. Control of the spanwise distribution of aerodynamic center--elastic axis offset is shown to be effective in producing 2P elastic twist, which improves forward-flight performance. The potential for improving hover performance by inducing large negative elastic twist is demonstrated. Preliminary design of two compliant rotors is accomplished. Relative to a conventional baseline rotor, both designs employ four-to-one torsional stiffness reductions outboard of the 50-percent radius. The first design uses a 20-degree swept tip at the 90-percent radius to induce 1P elastic twist, which improves rotor L/D by an average of 4 percent for the conditions analyzed. Vibratory pushrod loads are reduced by up to 50 percent, and blade flatwise stress is reduced by approximately 10 percent. GRA

N78-10052# Mechanics Research, Inc., McLean, Va. Electronics Systems Div.
FEASIBILITY ANALYSIS FOR A MICROWAVE DEICER FOR HELICOPTER ROTOR BLADES Final Report
Bertram Magenheim and Frank Hains May 1977 280 p refs
(Contract DAAJ02-75-C-0042; DA Proj. 1F2-63209-DB-38)
(AD-A042581; USAAMRDL-TR-76-18) Avail: NTIS HC A13/MF A01 CSCL 01/3

An analysis of the feasibility of utilizing microwave energy to deice helicopter rotor blades is presented. The analysis is based upon the coupling of microwave energy to the ice layers by means of dielectric surface waveguides coating the leading edge of the rotor blades where the ice accumulates. The thickness of the dielectric coating is adjusted by design so that in the ice-free condition a loosely bound surface wave may propagate along the coating with only minor losses. As the ice accumulates, tending to thicken the surface waveguides, the surface wave, becoming more tightly bound, undergoes higher losses, dissipating much of its energy in the glossy ice layer. The dissipation of energy in the ice raises its temperature above the level required for breaking its bond to the blade, which occurs before any melting takes place. The analysis considers four major topics: (1) the properties of surface waveguides, including dielectrics suitable electrically and mechanically for rotor blades and the dielectric properties of rotor ice; (2) dissipation and heat distribution theory; (3) the problems associated with coupling microwave energy to the surface waveguides; and (4) the typical and preliminary configuration, and the cost of installing microwave deicers in UH-1 helicopters in production quantities.

Author (GRA)

N78-10053# Naval Air Test Center, Patuxent River, Md.

THE NUMERICAL ANALYSIS OF AIR COMBAT ENGAGEMENTS DOMINATED BY MANEUVERING PERFORMANCE

W. R. Simpson and R. A. Oberle 20 Jun. 1977 85 p refs

(AD-A042483; NATC-TM-77-2-SA) Avail: NTIS MF A01 CSCL 15/7

An analysis capability has been developed for use by the training and 'test and evaluation' communities to quantify air combat maneuvering engagement outcomes. Details of this analysis capability in the form of computer programs for producing analytic engagement data are presented. Results from a sample test data base are presented to illustrate analysis and conclusion forming methods. The conclusions from the sample data set are not intended to represent actual strategic decisions but are exemplary only. GRA

N78-10054# Boeing Aerospace Co., Seattle, Wash. Military Airplane Development.

INNOVATIVE AIRCRAFT DESIGN STUDY. TASK 2: DESIGN SUBTASK 1. CHEMICALLY FUELED AIRCRAFT. VOLUME 2: APPENDICES

Jun. 1977 175 p refs

(Contract F33615-76-C-0122)

(AD-A044319) Avail: NTIS HC A08/MF A01 CSCL 01/3

The following topics are discussed: (1) Analysis of innovative configurations; (2) parametric configuration characteristics; (3) Stedlec engine characteristics; (4) circular body cross section configuration characteristics; (5) technology assessment; (6) mission sensitivity; (7) weights methodology; and (8) advanced technology cost factor methodology. Author

N78-10055# Naval Intelligence Support Center, Washington, D. C. Translation Div.

THE INVESTIGATION OF TAKE-OFF AND LANDING CHARACTERISTICS OF JET SHORTENED TAKE-OFF AND LANDING AIRCRAFT (STOL)

V. I. Surus 25 Jul. 1977 8 p refs Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 20, 1970 p 40-44

(AD-A044292; NISC-Trans-3947) Avail: NTIS HC A02/MF A01 CSCL 01/3

The negative effect of secondary forces induced by the jet flow of the engine because of its ejection properties is not taken into account during the examination of aerodynamic and take-off and landing characteristics of jet STOL and VTOL aircraft (vertical take-off and landing aircraft). It can be so significant for certain STOL configurations (Figure 1) that aircraft equipped with a BLC system (boundary layer control) could be more preferable. GRA

N78-10056# Aeronautical Systems Div., Wright Patterson AFB, Ohio.

A STUDY OF TASK LOADING USING A THREE MAN CREW ON A KC-135 AIRCRAFT Final Report, Nov. 1975 - Mar. 1976

Richard Geiselhart, Richard J. Schiffler, and Larry J. Ivey Jan. 1976 47 p refs

(AD-A044257; ASD-TR-76-19) Avail: NTIS HC A03/MF A01 CSCL 01/3

A series of flight tests were conducted to assess the feasibility of reducing crew size on KC-135 from 4 to 3. A dual INS was installed in the test aircraft, and refueling missions flown task times of crew performing duties were recorded. Subjects also completed questionnaires. It was concluded that on several types of missions a three man crew leads to extremely high workloads. Author (GRA)

N78-10057# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

A FEASIBILITY STUDY TO DEVELOP OPTIMIZATION ALGORITHMS FOR AIRCRAFT STRUCTURES M.S. Thesis

Ronald L. Evans and Bruce P. Christensen Jun. 1977 130 p refs

(AD-A044190; AFIT-LSSR-30-77A) Avail: NTIS HC A07/MF A01 CSCL 01/3

The concept of design to cost requires accurate cost estimation throughout the acquisition process of a major weapon system. Cost estimation is particularly important during the conceptual and validation phases. This research effort was directed toward improving cost estimation techniques for aircraft structures. Previous cost estimates had been derived through the use of a Vehicle Design and Evaluation Program (VDEP) which designed an aircraft structure to a minimum weight for a given set of structural parameters. However, a vehicle designed for minimum weight did not necessarily result in a structure with the lowest cost. This study examined the feasibility of developing algorithms which would, together with VDEP, design a cost optimized airframe structure. Cost as the dependent variable was regressed with load factor, rib spacing, structural types, skin thickness, and weight as the independent variables. The results of the research showed that it is feasible to develop cost optimization algorithms by using the highly significant relationship between skin thickness and rib spacing. The analysis further indicated that when weight was removed from the regression models, skin thickness became the key design parameter. Author (GRA)

N78-10058# Boeing Aerospace Co., Seattle, Wash. Logistics Support and Services.

LIFE CYCLE COST OF C-130E WEAPON SYSTEM Interim Report, 29 Jun. 1976 - 3 Jun. 1977

Frank D. Brown, Gary A. Walker, David H. Wilson, and Duncan L. Dieterly (AF Human Resources Lab.) Jul. 1977 71 p refs

(Contract F33615-76-C-0062; AF Proj. 1959)

(AD-A044046; AFHRL-TR-77-46) Avail: NTIS HC A04/MF A01 CSCL 01/3

Human and material resource data accumulated from all available Air Force sources is used to calculate the approximate life cycle cost (LCC) of the C-130E Hercules aircraft. The data was located, collected and reduced to computer files under another phase of the study. The Air Force Cost Analysis and Cost Estimating (CACE) model was modified and used to calculate the C-130E LCC. Based on fifteen years of Air Force data (1962-1976) a LCC estimate was calculated. The methodology for determining the historical LCC may be applied to other systems. The primary difficulty in computing historical LCC estimates is the lack of required data files and the low quality control on many data variables. This research provides a methodology and a guide for accomplishing historical LCC on other weapon systems. The reason for determining historical LCC is to establish a baseline that can be applied to new weapon system development programs to identify possible areas for redesign to reduce future weapon system LCC. This document is the third of a series of five Technical Reports emanating from this Project 1959 Phase 1 study, namely: AFHRL-TR-77-40 C-130E Hercules Aircraft: Review of Published Literature and Structured Interviews (Available to U.S. Government Agencies Only); AFHRL-TR-77-48 Historical Analysis of C-130E Resources; AFHRL-TR-77-46 Life Cycle Cost of C-130E Weapon System; AFHRL-TR-77-64(I) Historical Resource Utilization Methodology; and AFHRL-TR-77-64(I) Historical Task Analysis of C-130E Personnel. Author (GRA)

N78-10059# General Dynamics/Convair, San Diego, Calif.

WEAPON SYSTEM COSTING METHODOLOGY IMPROVED

STRUCTURAL COST ANALYSIS Final Report, Jul. 1975 - Feb. 1977
R. E. Kenyon May 1977 281 p refs
(Contract F33615-75-C-3148; AF Proj. 1368)
(AD-A044037; AFFDL-TR-77-24) Avail: NTIS HC A13/MF A01 CSCL 01/3

This report describes a study to improve a previously developed weapon system costing methodology for aircraft airframes and basic structures under Contract F33615-72-C-2083. The methodology is part of a preliminary design level technique for the cost estimation flight vehicle structures. Applications of the method have indicated a number of areas where further study and development could be expected to provide an advanced state-of-the-art capability. This study was directed towards that end. The study was limited to the specific changes consisting of: (1) development of complexity factors for technologies and materials represented by the advanced strategic bomber wing carry-through box, (2) modification of raw material cost estimating relationships (CERs) to increase sensitivity to material product form and type of scrappage, (3) investigation of additional assembly techniques and adding or modifying corresponding cost estimating factors, (4) modification of existing CERs to include evaluation of variations in the degree of commonality involved, (5) determination of the effect of production rate on recurring production costs, and (6) determination of the variation in learning curve factors due to variation in the type of material or type of construction. Detailed results are described. Author (GRA)

N78-10006*# Advisory Group for Aerospace Research and Development, Paris (France).
POSSIBILITIES AND GOALS FOR THE FUTURE SST
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 3-12 refs Repr. from J. Aircraft, v. 12, no. 12, Dec. 1975 p 919-929 Presented at 13th AIAA Aerospace Sci. Meeting, Pasadena, Calif., 20-22 Jan. 1975 (For availability see N78-10005 01-01)
(Grants NGL-33-016-119; NGR-33-016-131)
(AIAA-Paper-75-254) Avail: NTIS HC A07/MF A01 CSCL 01C

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N78-10060*# Southern Illinois Univ., Carbondale.
PRELIMINARY CANDIDATE ADVANCED AVIONICS SYSTEM FOR GENERAL AVIATION Final Report
T. M. McCalla, F. L. Grismore, S. E. Greatline, and L. M. Birkhead Jul. 1977 248 p refs
(Contract NAS2-9310)
(NASA-CR-152025) Avail: NTIS HC A11/MF A01 CSCL 01D

An integrated avionics system design was carried out to the level which indicates subsystem function, and the methods of overall system integration. Sufficient detail was included to allow identification of possible system component technologies, and to perform reliability, modularity, maintainability, cost, and risk analysis upon the system design. Retrofit to older aircraft, availability of this system to the single engine two place aircraft, was considered. Author

N78-10061*# Systems Technology, Inc., Hawthorne, Calif.
PRELIMINARY CANDIDATE ADVANCED AVIONICS SYSTEM (PCAAS) Final Report
Gary L. Teper, Roger H. Hon, and Richard K. Smyth Sep. 1977 189 p refs
(Contract NAS2-9311)
(NASA-CR-152026; TR-1084-1) Avail: NTIS HC A09/MF A01 CSCL 01D

Specifications which define the system functional requirements, the subsystem and interface needs, and other requirements such as maintainability, modularity, and reliability are summarized. A design definition of all required avionics functions and a system risk analysis are presented. Author

N78-10062*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DESCRIPTION OF PATH-IN-THE-SKY CONTACT ANALOG PILOTING DISPLAY
Charles E. Knox and John Leavitt (Sperry Rand, Corp., Hampton, Va.) Oct. 1977 23 p refs
(NASA-TM-74057; L-11812) Avail: NTIS HC A02/MF A01 CSCL 01D

A contact analog display called Path-In-The-Sky (PITS) integrates information on airplane attitude, airplane kinematic performance, navigation situation, and path prediction into one instrument. The pictorial format utilized in the PITS display concept was designed to reduce the required instrument scan and to simplify interpretation of informtion with the objective of reducing pilot work load. Described are the symbology of the PITS display, the coordinate systems used to generate the display, and the magnitudes of pertinent geometric characteristics selected during the display development. Also included are examples of the PITS display generated on a stand-alone graphics computer. Author

N78-10063# Ohio Univ., Athens. Avionics Engineering Center.
INSTRUMENT LANDING SYSTEM IMPROVEMENT PROGRAM: FAR-FIELD MONITORING Final Report, Oct. 1972 - Jan. 1975
Jan. 1975 87 p refs
(Contract DOT-FA69WA-2066)
(AD-A042320/2; EER-5-21; FAA-RD-75-201) Avail: NTIS HC A05/MF A01 CSCL 01/2

Methods of far-field extrapolation monitoring of the ILS glide slope angle were investigated. The use of a quasilinearization algorithm to determine path angle and width from measurements below obstruction heights at the middle marker is described with results for various fault conditions tabulated. A precision space modulation quotient monitor for measuring high values of DDM at low signal levels is described. A description of investigations of a field strength monitor using the capture effect principle to sense changes in low altitude field strength caused by environmental effects is included. Author

N78-10064# Army War Coll., Carlisle Barracks, Pa. Field Artillery.
IMPROVING RELIABILITY OF AVIONICS EQUIPMENTS THROUGH ENGINEERING TESTING
Calvin G. Franklin 8 Jun. 1977 170 p refs
(AD-A042454) Avail: NTIS HC A08/MF A01 CSCL 09/5

The basic consideration in this exploratory study is: Can the reliability of avionics be enhanced by improving (1) the reliability test methodology, (2) our reliability test philosophy, and (3) performing tests in a more realistic test environment. Mr. Wallis J. Willoughby, Deputy Chief of Naval Materiel for Reliability and Maintainability, Naval Materiel Command, made the statement that testing is probably responsible more than any other single factor for the poor reliability of military procurements. This study suggests a strategy for the acquisition of avionics equipment with the goal of improving reliability by finding and correcting engineering design deficiencies as early as possible in the Acquisition Process (Engineering Development Testing). Information on reliability problems as associated with avionic reliability was derived from a literature search (primarily previous studies in the field) and personal interviews with experts in the field of avionics reliability. The paper concludes with a series of recommendations that may result in improved reliability and contribute to the cost of ownership of avionics equipment. Author (GRA)

N78-10065# Colorado State Univ., Fort Collins. Dept. of Electrical Engineering.
DIGITAL FILTER DESIGN AND IMPLEMENTATION METHODS Final Technical Report, 4 Apr. 1973 - 30 Jun. 1974
Thomas A. Brubaker Jul. 1977 168 p refs
(Contract F33615-73-C-1253; AF Proj. 2003)
(AD-A042848; AFAL-TR-75-211) Avail: NTIS HC A08/MF A01 CSCL 09/5

This report describes methods for the design and implementation of digital filters that have applications in modern aircraft avionics and flight control systems. Design of the digital filters and the interaction between the design and implementation are emphasized. Multiplexing of digital filters is discussed.
Author (GRA)

N78-10066# Hughes Aircraft Co., Culver City, Calif. Display Systems Lab.
SIMULTANEOUS SENSOR-PRESENTATION TECHNIQUES STUDY Final Report, 1 Jun. 1976 - 30 Jan. 1977
T. A. DuPuis Jul. 1977 154 p refs
(Contract N00014-76-C-0802)
(AD-A043355; HAC-P77-197R; HAC-Ref-D7344; ONR-CR-213-142-1F) Avail: NTIS HC A08/MF A01 CSCL 09/5

This study investigated the utility and feasibility of combining imagery from several airborne sensors and data sources on a single real-time display. The baseline sensors and data sources considered for an advanced, high performance attack aircraft included radar, FLIR, TV, laser spot tracker/designator/ranger, warning receivers, a priori data (cartography, target/threat coordinates, reconnaissance imagery of target) and data-linked target/threat information. Several promising simultaneous data presentations were determined for use within the key phases of an interdiction mission. These were simulated by the superposition of static imagery and qualitatively evaluated. The mechanization complexity of implementing each display combination, as well as a highly flexible general system implementation, was examined. It was concluded that all of the key hardware elements required are presently available or in development. Many are already onboard or scheduled for incorporation in tactical aircraft and may be time-shared for the display of multisensor information.
Author (GRA)

N78-10067# Army Aviation Engineering Flight Activity, Edwards AFB, Calif.
LOW AIRSPEED SENSOR LOCATION TESTS AH-1G HELICOPTER Final Report, Dec. 1975 - Apr. 1976
Kenneth R. Ferrell, Barclay H. Boirun, and Gary E. Hill Feb. 1977 49 p refs
(AD-A044327; USAAEFA-75-19-1) Avail: NTIS HC A03/MF A01 CSCL 01/4

During weapons fire control tests being conducted by Frankford Arsenal, Philadelphia, Pennsylvania, it was necessary to determine the optimum location for an Elliott low airspeed system mounted on an AH-1G helicopter to improve the accuracy of the actual aircraft airspeed signal to the fire control computer. The airspeed system was provided by Frankford Arsenal, and the necessary mounting hardware was constructed by the United States Army Aviation Engineering Flight Activity, Edwards Air Force Base, California. Nine airspeed indicator locations along the fuselage from the engine mount to the forward canopy area were tested. The optimum location tested was at fuselage station 128, water line 104, and buttline -35. The Frankford system was then calibrated at the optimum location, and the electronic linearization circuits were added to the computer. This location for the linearized system provided accurate airspeed information out of ground effect from 15 knots calibrated airspeed (KCAS) rearward to 125 KCAS forward, and lateral airspeed from 28 KCAS left to 25 KCAS in right sideward flight. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N78-10068*# Massachusetts Inst. of Tech., Cambridge. Dept. of Aeronautics and Astronautics.
AN ASSESSMENT OF TECHNOLOGY FOR TURBOJET ENGINE ROTOR FAILURES
Emmett A. Witmer, ed. Mar. 1977 425 p Workshop held at Cambridge, Mass., 29-31 Mar. 1977; sponsored by NASA
(NASA-CP-2017; E-8305) Avail: NTIS HC A18/MF A01 CSCL 21E

Design considerations, objectives, and approaches used in containing rotor burst debris are discussed. Methods are given for determining the fracture resistance of various materials used in providing lightweight shielding from fragment impact. For individual titles, see N78-10069 through N78-10090.

N78-10069*# Federal Aviation Administration, Washington, D. C.
FEDERAL AVIATION ADMINISTRATION'S APPROACH TO ENGINE ROTOR INTEGRITY
A. K. Forney *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 1-9 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Sections of the U.S. Airworthiness Standards which contribute to rotor integrity are explored. Reports published under NASA's Rotor Burst Protection program are included in current FAA studies to determine the weight penalty for two different levels of increased containment, and the penalty associated with protecting critical structure and systems, the passenger cabin, and the flight deck by strategic location of armor shields or deflector plates. Findings of the two studies will be used to propose revisions to regulations to reduce uncontained rotor failures. A.R.H.

N78-10070*# Civil Aviation Authority, Redhill (England). Power Plant Dept.
ENGINE NON-CONTAINMENT: THE UK CAA VIEW
G. L. Gunstone *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 11-32 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Airworthiness accidents account for roughly one quarter of the total number of accidents to public transport turbojet aircraft. The most reliable, practicable, and cost-effective means of minimizing damage outside the confines of the nacells is to make the aircraft design invulnerable to any debris which may affect the aircraft. A failure model was developed for use by aircraft builders in measuring the freedom from catastrophe factor of their desgin. Author

N78-10071*# Boeing Commercial Airplane Co., Seattle, Wash.
ROTOR BURST PROTECTION CRITERIA AND IMPLICATIONS
Ralph B. McCormick *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 37-43 refs (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Current aircraft design practices to minimize the hazard from rotor bursts are described. The consequences of non-contained engine failures and the impact of rotor burst protection systems on aircraft design are discussed. Author

N78-10072*# British Aircraft Corp. (Operating) Ltd., Bristol (England). Commercial Airplane Div.
ENGINE NON-CONTAINMENT: UK RISK ASSESSMENT METHODS
J. C. Wallin *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 45-63 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

More realistic guideline data must be developed for use in aircraft design in order to comply with recent changes in British civil airworthiness requirements. Unrealistically pessimistic results were obtained when the methodology developed during the Concorde SST certification program was extended to assess catastrophic risks resulting from uncontained engine rotors.
Author

N78-10073*# Rolls-Royce Ltd., Derby (England). Aero Div.
TYPES OF ROTOR FAILURE AND CHARACTERISTICS OF FRAGMENTS
D. McCarthy *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 65-92 (For availability see

N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Noncontained rotor failures in U.K. engines resulting from low cycle fatigue, low cycle fatigue with superimposed high cycle fatigue, and overheating and-or overspeeding were analyzed. The size, shape, weight, velocity, energy, and direction of the fragments released from turbines and compressors were studied and are presented in graph. Author

N78-10074*# Douglas Aircraft Co., Inc., Long Beach, Calif.
BLADE FRAGMENT ENERGY ANALYSIS
M. A. OConnor, Jr. *In* MIT An Assessm .nt of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 93-95 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Two classes of fan blade fragments were considered in an analysis of blade fragment energy. The first, of relatively small size (.15 pound) and energy, tends to rebound from the fan and case when liberated in an FOD encounter. These small fragments have relatively low secondary damage potential and are less demanding in terms of protection. The larger fan blade fragments are ejected in a more direct release trajectory with higher energy and hence can represent a higher potential hazard. Simplified analytical methods were used to describe blade fragment energy transfer kinematics, establish fragment energy levels, evaluate damage potential and configure protection. The approach, methodology, and application are discussed as a possible building block for other applications. Development of effective local protection using Kevlar is also discussed. Analysis methods developed and applied to the rebound fragment problem and to the large direct release fragment problem are described. Author

N78-10075*# Lockheed-California Co., Burbank.
DESIGNING THE L-1011 TO MINIMIZE ROTOR FAILURES EFFECTS
J. E. Wignot *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 97-100 (For availability see N78-10068 01-07)
HC A18/MF A01 CSCL 21E

Design philosophies used in the L-1011 aircraft to provide protection against rotor fragments include: (1) incorporating into the rotor design features that tend to promote small fragments if failure occurs; (2) containing the fragments within the engine shell or greatly reducing the energy content of those fragments that are eventually uncontained; (3) shielding vulnerable elements or systems with heavy structural members that tend to stop or deflect high velocity fragments; and (4) incorporating redundant and/or backup systems into the basic design and separating these systems so as to minimize the probability that more than one system will be damaged by an uncontained rotor fragment. Some of the design features that were incorporated into the Rolls-Royce RB211 engine are discussed, and two in-service experiences are considered in order to illustrate the practical operation of these features. Author

N78-10076*# Douglas Aircraft Co., Inc., Long Beach, Calif.
APPROACHES TO ROTOR FRAGMENT PROTECTION
M. A. OConnor, Jr. *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 101-103 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Key airworthiness design criteria considerations for fragment protection as found in various FAA requirements in FAR Parts 25 and 33, and in interpretive 8110 orders are reviewed. The impact of providing aircraft armor in lieu of engine armor for typical three- and four-engine wide bodied transports for protection within the length of the engine case as well as from fragments exiting ahead of the enlet engine inlet flange is assessed. For protection within the length of the engine case, armor weight penalties, plus fuel burned and dollar cost of carrying the armor protection are defined. Immediately ahead of the inlet flange, direct tangential impacts are predominant, but further forward, rebound impacts predominate. Armor thickness requirements and fuel cost impact of protection are given. Author

N78-10077*# Naval Air Propulsion Test Center, Trenton, N.J.
ROTOR BURST PROTECTION PROGRAM: EXPERIMENTATION TO PROVIDE GUIDELINES FOR THE DESIGN OF TURBINE ROTOR BURST FRAGMENT CONTAINMENT RINGS
G. J. Mangano, J. T. Salvino, and R. A. Delucia *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 107-149 (For availability see N78-10068 01-07)
(NASA Order C-41581-B)
Avail: NTIS HC A18/MF A01 CSCL 21E

Empirical guidelines for the design of minimum weight turbine rotor disk fragment containment rings made from a monolithic metal were generated by experimentally establishing the relationship between a variable that provides a measure of containment ring capability and several other variables that both characterized the configurational aspects of the rotor fragments and containment ring, and had been found from exploratory testing to have had significant influence on the containment process. Test methodology and data analysis techniques are described. Results are presented in graphs and tables. Author

N78-10078*# Massachusetts Inst. of Tech., Cambridge.
ANALYSIS OF SIMPLE 2-D AND 3-D METAL STRUCTURES SUBJECTED TO FRAGMENT IMPACT
E. A. Witmer, T. R. Stagliano, R. L. Spilker, and J. J. A. Rodal *In its* Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 151-215 refs (For availability see N78-10068 01-07)
(Grant NGR-22-009-339)
Avail: NTIS HC A18/MF A01 CSCL 21E

Theoretical methods were developed for predicting the large-deflection elastic-plastic transient structural responses of metal containment or deflector (C/D) structures to cope with rotor burst fragment impact attack. For two-dimensional C/D structures both, finite element and finite difference analysis methods were employed to analyze structural response produced by either prescribed transient loads or fragment impact. For the latter category, two time-wise step-by-step analysis procedures were devised to predict the structural responses resulting from a succession of fragment impacts: the collision force method (CFM) which utilizes an approximate prediction of the force applied to the attacked structure during fragment impact, and the collision imparted velocity method (CIVM) in which the impact-induced velocity increment acquired by a region of the impacted structure near the impact point is computed. The merits and limitations of these approaches are discussed. For the analysis of 3-d responses of C/D structures, only the CIVM approach was investigated. Author

N78-10079*# Boeing Co., Seattle, Wash.
DEVELOPMENT OF FIBER SHIELDS FOR ENGINE CONTAINMENT
R. J. Bristow and C. D. Davidson *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 217-234 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Tests were conducted in translational launchers and spin pits to generate empirical data used in the design of a Kevlar shield for containing engine burst debris. Methods are given for modeling the relationship of fragment characteristics to shielding requirements. The change in relative importance of shield mounting provisions as fragment energy is increased is discussed. Author

N78-10080*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
LIGHTWEIGHT ENGINE CONTAINMENT
A. T. Weaver *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 235-245 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Kevlar fabric styles and weaves were studied, as well as methods of application for advanced gas turbine engines. The Kevlar material was subjected to high speed impacts by simple projectiles fired from a rifle, as well as more complex shapes such as fan blades released from gas turbine rotors in a spin pit. Just contained data was developed for a variety of weave and/or application techniques, and a comparative containment weight efficiency was established for Kevlar containment applications. The data generated during these tests is being incorporated into an analytical design system so that blade containment trade-off studies between Kevlar and metal case

engine structures can be made. Laboratory tests and engine environment tests were performed to determine the survivability of Kevlar in a gas turbine environment. Author

N78-10081*# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
NUMERICAL ANALYSIS OF PROJECTILE IMPACT IN WOVEN TEXILE STRUCTURES
David Roylance *In its* Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 247-260 refs (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Computer codes were developed for simulating the dynamic fracture and viscoelastic constitutive response due to stress wave interaction and reflections caused by ballistic impact on woven textiles. The method, which was developed for use in the design and analysis of protection devices for personnel armor, has potential for use in studies of rotor blade burst containment at high velocity. Alterations in coding required for burst containment problems are discussed. Author

N78-10082*# Boeing Commercial Airplane Co., Seattle, Wash.
ANALYSIS METHODS FOR KEVLAR SHIELD RESPONSE TO ROTOR FRAGMENTS
J. H. Gerstle *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 261-275 refs (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Several empirical and analytical approaches to rotor burst shield sizing are compared and principal differences in metal and fabric dynamic behavior are discussed. The application of transient structural response computer programs to predict Kevlar containment limits is described. For preliminary shield sizing, present analytical methods are useful if insufficient test data for empirical modeling are available. To provide other information useful for engineering design, analytical methods require further developments in material characterization, failure criteria, loads definition, and post-impact fragment trajectory prediction. Author

N78-10083*# Norton Co., Worcester, Mass. Industrial Ceramics Div.
CERAMIC COMPOSITE PROTECTION FOR TURBINE DISC BURSTS
P. B. Gardner *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 277-293 refs (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Ceramic composite turbine disc protection panels for the A300B were developed using armor technology. Analytical predictions for modifying the ballistic projectile armor system were verified by a test program conducted to qualify the rotor containment system. With only a slight change in the areal density of the armor system a more than two-fold increase in kinetic energy protection level was achieved. Thickness of the fiber-glass reinforced plastic backing material was increased to achieve an optimum ratio of ceramic thickness to backing thickness for the different ballistic defeat condition. Author

N78-10084*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONCEPTS FOR THE DEVELOPMENT OF LIGHT-WEIGHT COMPOSITE STRUCTURES FOR ROTOR BURST CONTAINMENT
Arthur G. Holms *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 295-330 refs (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Published results on rotor burst containment with single materials, and on body armor using composite materials were used to establish a set of hypotheses about what variables might control the design of a weight-efficient protective device. Based on modern concepts for the design and analysis of small optimum seeking experiments, a particular experiment for evaluating the hypotheses and materials was designed. The design and methods for the analysis of results are described. The consequence of such hypotheses is that the device should consist of as many as four concentric rings, each to consist of a material uniquely chosen for its position in the penetration sequence. Author

N78-10085*# Pratt and Whitney Aircraft Group, East Hartford, Conn. Commercial Products Div.
DESIGN OF ROTORS FOR IMPROVED STRUCTURAL LIFE
J. T. Hill *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 331-346 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Major rotor design criteria are discussed with particular emphasis on those aspects of rotor design that ensure long life component integrity. Dynamic considerations, that necessitate tuning of bladed disk and seal assemblies to avoid excessive vibratory stress at both design and off-design conditions are reviewed as well as low cycle fatigue considerations, which have resulted in detailed analysis procedures to establish part temperature and stress variation throughout an operating cycle and extensive specimen and component fatigue testing to establish safe cyclic operating limits. The frequency, size, and behavior of intrinsic material defects were investigated. Manufacturing process improvements, including the application of increasingly sophisticated inspection techniques and quality control procedures are reviewed in light of their impact on component durability. Author

N78-10086*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
MATERIALS AND MANUFACTURING PROCESSES FOR INCREASED LIFE/RELIABILITY
R. E. Duttweiler *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 347-368 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Improvements in both quality and durability of disk raw material for both military and commercial engines necessitated an entirely new concept in raw material process control which imposes careful selection, screening and sampling of the basic alloy ingredients, followed by careful monitoring of the melting parameters in all phases of the vacuum melting sequence. Special care is taken to preclude solidification conditions that produce adverse levels of segregation. Melt furnaces are routinely cleaned and inspected for contamination. Ingots are also cleaned and inspected before entering the final melt step. Author

N78-10087*# Pratt and Whitney Aircraft Group, Middletown, Conn. Commercial Products Div.
NDE: A KEY TO ENGINE ROTOR LIFE PREDICTION
J. E. Doherty *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 369-382 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

A key ingredient in the establishment of safe life times for critical components is the means of reliably detecting flaws which may potentially exist. Currently used nondestructive evaluation procedures are successful in detecting life limiting defects; however, the development of automated and computer aided NDE technology permits even greater assurance of flight safety. Author

N78-10088*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF A FLIGHT-LINE DISK CRACK DETECTOR TO A SMALL ENGINE
John R. Barranger *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 383-388 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

A disk crack detector was developed and applied to a small military engine for use as a flight-line turbine crack monitor. The system consists of an eddy current type sensor and its cables within the engine, external connecting cables, and a remotely located electrical capacitance-conductance bridge and signal analyzer. As the turbine spins, the rotor is monitored by the sensor for radial surface cracks emanating from the interblade region of the rotor. Author

N78-10089*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TURBINE DISKS FOR IMPROVED RELIABILITY
Albert Kaufman *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 389-411 (For availability

see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Advanced disk structural concepts were employed to improve the cyclic lives and reliability of turbine disks. Analytical studies were conducted to evaluate bore-entry disks as potential replacements for the existing first-stage turbine disks in the CF6-50 and JT8D-17 engines. Results of low cycle fatigue, burst, fracture mechanics, and fragment energy analyses are summarized for the advanced disk designs and the existing disk designs, with both conventional and advanced disk materials. Other disk concepts such as composite, laminated, link, multibore, multidisk, and spline disks were also evaluated for the CF6-50 engine.
Author

N78-10090*# Trans World Airlines, Inc., Kansas City, Mo.
SOME AIRLINE EXPERIENCE IN PREVENTING ENGINE ROTOR FAILURES
John J. Morelli *In* MIT An Assessment of Technol. for Turbojet Engine Rotor Failures Mar. 1977 p 413-418 (For availability see N78-10068 01-07)
Avail: NTIS HC A18/MF A01 CSCL 21E

Methods used by airlines, with the assistance of the engine manufacturers to achieve control over the type of problems which lead to uncontained failure and avoid many potential problems are discussed.
Author

N78-10091*# Lockheed-Georgia Co., Marietta.
NOISE CHARACTERISTICS OF UPPER SURFACE BLOWN CONFIGURATIONS. EXPERIMENTAL PROGRAM AND RESULTS Final Report
W. H. Brown, N. Searle, D. F. Blakney, A. P. Pennock, and J. S. Gibson Oct. 1977 532 p refs
(Contract NAS1-13870)
(NASA-CR-145143; LG77ER0198) Avail: NTIS HC A23/MF A01 CSCL 20A

An experimental data base was developed from the model upper surface blowing (USB) propulsive lift system hardware. While the emphasis was on far field noise data, a considerable amount of relevant flow field data were also obtained. The data were derived from experiments in four different facilities resulting in: (1) small scale static flow field data; (2) small scale static noise data; (3) small scale simulated forward speed noise and load data; and (4) limited larger-scale static noise flow field and load data. All of the small scale tests used the same USB flap parts. Operational and geometrical variables covered in the test program included jet velocity, nozzle shape, nozzle area, nozzle impingement angle, nozzle vertical and horizontal location, flap length, flap deflection angle, and flap radius of curvature.
Author

N78-10092*# TRW, Inc., Cleveland, Ohio.
COST ANALYSIS OF ADVANCED TURBINE BLADE MANUFACTURING PROCESSES Final Report, Oct. 1976 - April 1977
C. F. Barth, D. E. Blake, and T. S. Stelson Oct. 1977 89 p refs
(NAS3-20378)
(NASA-CR-135203; TRW-1ER-7930) Avail: NTIS HC A05/MF A01 CSCL 21E

A rigorous analysis was conducted to estimate relative manufacturing costs for high technology gas turbine blades prepared by three candidate materials process systems. The manufacturing costs for the same turbine blade configuration of directionally solidified eutectic alloy, an oxide dispersion strengthened superalloy, and a fiber reinforced superalloy were compared on a relative basis to the costs of the same blade currently in production utilizing the directional solidification process. An analytical process cost model was developed to quantitatively perform the cost comparisons. The impact of individual process yield factors on costs was also assessed as well as effects of process parameters, raw materials, labor rates and consumable items.
Author

N78-10093*# Douglas Aircraft Co., Inc., Long Beach, Calif.
EFFECT OF FORWARD MOTION ON ENGINE NOISE
G. L. Blankenship, J. K. C. Low, J. A. Watkins, and J. E. Merriman Oct. 1977 198 p refs
(Contract NAS3-20031)
(NASA-CR-134954; MDC-J7708) Avail: NTIS HC A09/MF A01 CSCL 20A

Methods used to determine a procedure for correcting static engine data for the effects of forward motion are described. Data were analyzed from airplane flyover and static-engine tests with a JT8D-109 low-bypass-ratio turbofan engine installed on a DC-9-30, with a CF6-6D high-bypass-ratio turbofan engine installed on a DC-10-10, and with a JT9D-59A high-bypass-ratio turbofan engine installed on a DC-10-40. The observed differences between the static and the flyover data bases are discussed in terms of noise generation, convective amplification, atmospheric propagation, and engine installation. The results indicate that each noise source must be adjusted separately for forward-motion and installation effects and then projected to flight conditions as a function of source-path angle, directivity angle, and acoustic range relative to the microphones on the ground.
Author

N78-10094*# Systems Control, Inc., Palo Alto, Calif.
IDENTIFICATION OF SPEY ENGINE DYNAMICS IN THE AUGMENTOR WING JET STOL RESEARCH AIRCRAFT FROM FLIGHT DATA
Ronald L. DeHoff, W. Brady Reed, and Thomas L. Trankle Oct. 1977 155 p
(NASA Order A-36074-B)
(NASA-CR-152054) Avail: NTIS HC A08/MF A01 CSCL 21E

The development and validation of a spey engine model is described. An analysis of the dynamical interactions involved in the propulsion unit is presented. The model was reduced to contain only significant effects, and was used, in conjunction with flight data obtained from an augmentor wing jet STOL research aircraft, to develop initial estimates of parameters in the system. The theoretical background employed in estimating the parameters is outlined. The software package developed for processing the flight data is described. Results are summarized.
Author

N78-10095# Tennessee Univ., Tullahoma. Space Inst.
INVESTIGATION OF FEASIBLE NOZZLE CONFIGURATIONS FOR NOISE REDUCTION IN TURBOFAN AND TURBOJET AIRCRAFT. VOLUME 3: SHROUDED SLOT NOZZLES Final Report, Aug. 1975 - Mar. 1977
B. H. Goethert, J. R. Maus, W. A. Dunnill, M. C. Joshi, and V. Veerasamy Mar. 1977 126 p refs
(Contract DOT-FA72WA-3053)
(AD-A041782/4; FAA-RD-75-162-Vol-3) Avail: NTIS HC A07/MF A01 CSCL 21/5

The acoustic and fluid dynamic characteristics of a slot nozzle were studied. The nozzle had an aspect ratio of 27 with an ejector shroud having a cross sectional area of 4 times the primary nozzle area. Shroud length, shroud divergence ratio, and acoustical impedance of the shroud wall were varied. Tests were conducted for primary flow Mach numbers from 0.5 to choking and stagnation temperatures from ambient to 1200 R. It is shown that both the thrust and the noise attenuation characteristics of the ejector shroud improve with increasing length. Thrust increases of near 40% were obtained for the longest shroud tested. A noise reduction of 13 db was obtained for the lined shroud with a near choked, high temperature primary jet. The corresponding thrust augmentation was approximately 20%.
Author

N78-10096*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
INDEPENDENT POWER GENERATOR Patent Application
Richard N. Young, inventor (to NASA) Filed 30 Jul. 1976 16 p
(NASA-Case-LAR-11208-1; US-Patent-Appl-SN-710036) Avail: NTIS HC A02/MF A01 CSCL 21E

A gas turbine powered aircraft auxiliary power system is described. The system is capable of efficiently supplying all aircraft auxiliary services both in flight and on the ground. It is capable also of operating independently of the aircraft main engines. The system employs multiple gas turbine compressor stages, and utilizes the aircraft cabin as a plenum chamber between the first and second compressor stages, thereby accomplishing cabin pressurization, ventilation and heating.
NASA

N78-10097*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF AN F100 MULTIVARIABLE CONTROL USING A REAL-TIME ENGINE SIMULATION
John R. Szuch, Charles Skira (AFSC), and James F. Soeder 1977 17 p refs Presented at 13th Propulsion Conf., Orlando, Fla., 11-13 Jul. 1977; sponsored by AIAA and Soc. of Automotive Engr.
(NASA-TM-X-73648; E-9155) Avail: NTIS HC A02/MF A01 CSCL 21E

A multivariable control design for the F100 turbofan engine was evaluated, as part of the F100 multivariable control synthesis (MVCS) program. The evaluation utilized a real-time, hybrid computer simulation of the engine and a digital computer implementation of the control. Significant results of the evaluation are presented and recommendations concerning future engine testing of the control are made. Author

N78-10098*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE PROMISE OF EUTECTICS FOR AIRCRAFT TURBINES
Hugh R. Gray 1977 21 p refs Presented at Mater. Show and Conf., Chicago, 25-27 Oct. 1977; sponsored by ASM
(NASA-TM-73714; E-9258) Avail: NTIS HC A02/MF A01 CSCL 21E

The current status of the first generation eutectics, gamma/gamma transition - delta and NiTaC-13, is described in detail. Several second generation systems, such as gamma/gamma transition - alpha and NiTaC 3-116A, gamma - beta, and COTAC 74 are also reviewed with particular emphasis on their critical physical and mechanical properties, future research directions, and potential applications. Results of recent cost-benefit analyses of eutectic turbine blades are discussed. Author

N78-10099*# Cincinnati Univ., Ohio. Dept. of Aerospace Engineering.
AN INVESTIGATION OF TEMPERATURE DISTRIBUTION IN COOLED GUIDE VANES
R. Kotwal, W. Tabakoff, and A. Hamed 1 Oct. 1977 143 p refs
(Contract NAS2-7850)
(NASA-CR-152048) Avail: NTIS HC A07/MF A01 CSCL 21E

A numerical study to determine the temperature distribution in the guide vane blades of a radial inflow turbine is presented. A computer program was developed which permits the temperature distribution to be calculated when the blade is cooled internally using a combination of impingement and film cooling techniques. The study is based on the use of the finite difference method in a two dimensional heat conduction problem. The results are then compared to determine the best cooling configuration for a certain coolant to primary mass flow ratio. Author

N78-10100# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
HIGH VELOCITY JET NOISE SOURCE LOCATION AND REDUCTION. TASK 1: ACTIVATION OF FACILITIES AND VALIDATION OF SOURCE LOCATION TECHNIQUES Final Report, Aug. 1973 - Mar. 1976
C. T. Savell and E. J. Stringas 22 Feb. 1977 601 p refs
(Contract DOT-OS-30034)
(AD-A041848; R77AEG187; FAA-RD-76-79-1) Avail: NTIS HC A99/MF A01 CSCL 14/2

This report summarizes the results of Task 1 as conducted under the subject program. The intent of this 29-month effort was to check out candidate test facilities and noise source location techniques to ensure that the best possible jet noise data over the full range of conditions (velocities ranging from 600 fps to 3000 fps with the best instrumentations are obtained. The facilities activated and validated included: two anechoic facilities; the University of Southern California in Los Angeles, California, and the University of British Columbia in Vancouver, Canada; two outdoor scale-model jet noise facilities; the General Electric Jet Exhaust Noise Outdoor Test Stand in Evendale, Ohio, and the General Electric Corporate Research and Development Center Hot Jet Noise Facility at Schenectady, New York; one large-scale engine outdoor test stand; a super suppressed J79 engine at the General Electric Facility at Edwards Air Force Flight Test Center, California; one aerodynamic performance facility; the FluiDyne Engineering Corporation Aerodynamic Laboratory at Medicine Lake, Minnesota; and the GE Anechoic Jet Noise Test Facility. Numerous noise source location techniques were subjected to a preliminary screening study from which three techniques: the in-jet to far-field correlation approach, the hole-in-the-wall, and ellipsoidal mirror were selected and carried through an experimental demonstration stage. Based on the results from this phase of the activity, the ellipsoidal mirror microphone technique was recommended for use in subsequent program tasks. GRA

N78-10101# Bendix Corp., South Bend, Ind.
AN EVALUATION OF THERMOELECTRIC COOLING AS APPLIED TO ENGINE CONTROL ELECTRONICS
C. S. Longstreet, W. Lorenz, W. J. McPhee, and D. C. Thoman May 1977 116 p refs
(Contract F33615-74-C-2068)
(AD-A042378; AFAPL-TR-77-24) Avail: NTIS HC A06/MF A01 CSCL 21/5

Electronic elements of the engine control systems of future military aircraft will require protection against the high ambient temperatures expected at their mounting locations on the engines. The thermally conditioned module built and tested in this program was designed to provide this protection, with substantial margins; ambient temperatures to 750 F and fuel (coolant) temperatures to 300 F were employed. The unit employs thermal shields to minimize heat conducted to the electronics. The electronics themselves were cooled by a thermoelectric cooler. High efficiency heat exchangers were designed for this unit. The unit weighed 1.45 lbs. Under worst case operating conditions, it pumped approximately 1300 BTU/hour to the fuel. Author (GRA)

N78-10102# Mechanical Technology, Inc., Latham, N. Y.
ADVANCED COMPRESSOR SEAL TESTS Final Technical Report, Apr. 1975 - Dec. 1976
M. Eusepi and L. W. Winn Apr. 1977 73 p
(Contract F33615-75-C-2062)
(AD-A042390; AFAPL-TR-77-22) Avail: NTIS HC A04/MF A01 CSCL 21/5

The continuation of the development of a new resilient seal concept entitled the 'J'-Seal is described. The concept uses a pressure loaded membrane and hydrostatic bearing principles to maintain a minimum stator to rotor clearance. Following the development of a complex seal analyses performed in an earlier phase of this program, the seal was built and tested. Seal distortions due to inadequate manufacturing techniques have been substantially reduced through the use of brazing with a high temperature gold alloy instead of welding. The test results presented in this report support the analytically predicted trends. Author (GRA)

N78-10103# Lockheed-Georgia Co., Marietta.
INVESTIGATION OF ELECTRON-HYDRAULIC PULSE MOTORS FOR AIRCRAFT UTILITY FUNCTIONS Final Report, 3 Feb. 1975 - Dec. 1976
Edwin W. Rumrill, Jr. and Frank D. Lewis May 1977 147 p refs
(Contract F33615-75-C-2005)
(AD-A042377; LG77ER0099; AFAPL-TR-77-14) Avail: NTIS HC A07/MF A01 CSCL 01/3

The purpose of this electrohydraulic pulse motor (EHPM) technology-development project was to investigate feasibility and applicability and demonstrate capability of the EHPM concept for mating the power of hydraulics with the 'intelligence' of the digital computer for use in future aircraft utility systems. Recent dramatic developments in electronic circuit manufacturing necessitates the review of control concepts for the purpose of redefining the optimum mix of technologies. The significant reduction in cost, size, and weight and increase in reliability of digital computers offers the potential for performing the bulk of control functions within the electronic circuit in lieu of the hydraulic circuit. The EHPM concept is highly compatible with this concept, but existing units are used in machine tools and are not configured to achieve maximum power and minimum weight as needed for aircraft use. In this program the designs of EHPM's for aircraft use was investigated; an EHPM was designed and constructed

using an aircraft type hydraulic motor; an input system consisting of a micro computer, an interface board, input and output position encoders, an electric pulse motor (EPM) driver, and a software program was designed and constructed; the EHPM and the input system were tested as components and as a system; the system was used to control the C-5 iron bird flap system with simulated loading; the EHPM unit was subjected to a durability test; and a survey of various aircraft subsystems where the EHPM could be a viable alternative was accomplished. GRA

N78-10104# Vought Corp. Advanced Technology Center, Inc., Dallas, Tex.
V-STOL EJECTOR SHORT DIFFUSER STUDY Final Report, Mar. 1975 - Jun. 1976
R. M. ODonnell and R. A. Squyers 16 Jun. 1976 90 p refs
(Contract N62269-75-C-0317)
(AD-A042319; ATC-B-94300/6CR-26; NADC-77165-30) Avail: NTIS HC A05/MF A01 CSCL 01/3

Development of thrust augmenting ejectors has produced ejector/diffuser configurations capable of achieving the high levels of thrust augmentation necessary for V/TOL aircraft propulsion requirements. Experimental testing has shown that thrust augmenting ejectors can be made more compact by reducing diffuser length with active diffusion boundary layer control employing the Antiseparation Tailored Contour (ATC). Thrust augmentation and internal flow measurements were determined in compact high performance thrust augmentors with various length diffusers. The short ATC/diffusers tested showed significant improvements when compared to previous ejector diffusers. Measured thrust augmentation ratios with an optimum short ATC/diffuser were 10% greater than those with an equivalent straight wall diffuser. Length reductions of 36% were indicated for nominal augmentation ratios of 1.7. The important factors which influence the design and operation of compact thrust augmentor ejector/diffusers have been defined. Author (GRA)

N78-10105# Sheffield Univ. (England). Dept. of Chemical Engineering and Fuel Technology.
POLLUTANT, MINIMIZATION BY BLUE FLAME STAGED COMBUSTION Interim Report
Derek S. Prior 1977 218 p refs
(Grant AF-AFOSR-2682-74)
(AD-A042979; AFOSR-77-0843TR) Avail: NTIS MF A01 CSCL 21/2

A general analysis for a steady state heterogeneous Well Stirred Reactor (WSR) is presented in which fuel evaporation, turbulent mixing and finite rate chemical kinetics are treated. A mathematical model for the BFB featuring a 17 step quasi global reaction mechanism, recirculation and a reactor network containing 2 WSR's is thus derived; a general modular computer program suitable for parametric evaluations was developed to facilitate this type of modelling. Convergence of the model solution scheme could be obtained for fuel lean and stoichiometric conditions only. Reasonably good agreement between measured and predicted values of BFE exit flow temperature, NO and CO pollutant emissions is apparent. Author (GRA)

N78-10106# Purdue Univ., Lafayette, Ind. Project SQUID Headquarters.
SUMMARY OF THE PROJECT SQUID WORKSHOP ON TRANSONIC FLOW PROBLEMS IN TURBOMACHINERY
T. C. Adamson, Jr. (Michigan Univ., Ann Arbor) Jul. 1977 23 p ref Workshop held at Monterey, Calif., 11-12 Feb. 1977
(Contract N00014-75-C-1143; Proj. SQUID)
(AD-A043317; SQUID-MICH-18-PU) Avail: NTIS HC A02/MF A01 CSCL 13/7

A Workshop on Transonic Flow Problems in Turbomachinery was held at the Naval Postgraduate School. Because of the growing need to improve engine performance characteristics, the interest in internal transonic flows has greatly increased. This workshop was held to inform the various workers in the field about the latest work being done and to provide a number of opinions of what important work remains. A volume has been assembled consisting of the thirty-eight papers presented, the discussion following each paper, and the review and discussion sessions at the end of the workshop; this volume is entitled Transonic Flow Problems in Turbomachinery. GRA

N78-10107# ARO, Inc., Arnold Air Force Station, Tenn.
AN ANALYSIS OF THE INFLUENCE OF SOME EXTERNAL DISTURBANCES ON THE AERODYNAMIC STABILITY OF TURBINE ENGINE AXIAL FLOW FANS AND COMPRESSORS Final Report, Jun. 1973 - Jun. 1977
William F. Kimzey AEDC Aug. 1977 282 p refs
(AD-A043543; ARO-ETF-TR-77-47; AEDC-TR-77-80) Avail: NTIS HC A13/MF A01 CSCL 21/5

The overall objective of the work described herein was to develop an improved method for the computation of the influence of external disturbances on turbine engine compressor stability, and, in so doing, to gain added physical insight into the destabilizing processes. The objectives were accomplished through the development of a one-dimensional, time-dependent mathematical compressor model for analysis of planar disturbances and an extension of the model to a three-dimensional form for analysis of distorted inflows. The models satisfy mass, momentum and energy equations on a time-dependent basis. Compressor stage force and shaft work were determined from empirical stage characteristics with corrections made for unsteady cascade airfoil aerodynamics. The system of equations comprising the model is solved using a digital computer. Example problems with comparisons to experiments are presented for three different compressors. Example problems solved using the one-dimensional analysis include: determination of the steady-state stability limit (surge line) with undisturbed flow, instability caused by oscillating planar inflow, dynamic response of a compressor to oscillating entry pressure, dynamic response to oscillating discharge pressure, and compressor instability caused by rapid upward ramps of entry temperature. Example problems solved using the distortion model include: stability limit (surge) line reduction caused by a combined radial and circumferential pressure distortion, time-variant distortion effects, pure radial pressure distortion effects, and pure pressure and temperature circumferential distortion effects. GRA

N78-10108# McDonnell Aircraft Co., St. Louis, Mo.
TURBINE ENGINE VARIABLE CYCLE SELECTION PROGRAM SUMMARY Final Report, Jul. 1973 - Jan. 1977
F. C. Glaser and W. B. Weber Apr. 1977 57 p refs
(Contract F33615-73-C-2070; AFAPL-TR-77-17)
(AD-A043408) Avail: NTIS HC A04/MF A01 CSCL 21/5

A systematic engine/airframe evaluation procedure was developed and used to assess interactions for fixed and variable geometry engine concepts in tactical aircraft. The evaluation procedure provides a rapid and inexpensive technique for evaluations of advanced engine concepts for extensive matrices of potential aircraft maneuverability and multi-mission requirements. Author (GRA)

N78-10109# General Electric Co., Lynn, Mass. Aircraft Engine Group.
DEVELOPMENT OF HOT ISOSTATICALLY PRESSED RENE 95 TURBINE PARTS Final Report, Jul. 1973 - Jul. 1976
P. S. Mathur and J. L. Bartos May 1977 313 p
(Contract DAAJ02-73-C-0106)
(AD-A043688; USAAMRDL-TR-76-30) Avail: NTIS HC A14/MF A01 CSCL 21/5

To arrest the increasing cost of materials and fabrication techniques for high-strength gas turbine components, a contract was awarded to the General Electric Company to develop a reliable, low-cost, reproducible powder metallurgy production process for manufacturing premium quality HIP Rene 95 T700 gas generator turbine disks and cooling plates. The work to accomplish this objective was subdivided into four tasks. GRA

N78-10110# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
COMPRESSOR BLADE MANUFACTURE BY ELECTROCHEMICAL MACHINING. ADVANCED TURBINE ENGINE GAS GENERATOR Final Technical Report, Dec. 1973 - Mar. 1977
W. I. Westphal and A. Lingen Wright-Patterson AFB, Ohio AFAPL Aug. 1977 62 p
(Contract F33657-72-C-0206)
(AD-A043742; AFAPL-TR-77-33) Avail: NTIS HC A04/MF A01 CSCL 21/5

Compressor blades for the ATEGG GE14 engine were

manufactured using electrochemical machining to form the airfoils. Elaborate dimensional inspections were performed on the as-machined surfaces. The blades were tested for frequency, nodal patterns, and fatigue strength and were compared to control blades made by conventional methods. Author (GRA)

N78-10007*# Advisory Group for Aerospace Research and Development, Paris (France).
REVIEW OF PROBLEMS IN APPLICATION OF SUPERSONIC COMBUSTION
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 13-30 refs Repr. from J. Roy. Aeronaut. Soc. (Engl.), v. 68, no. 645, Sep. 1964 p 575-595 (For availability see N78-10005 01-01)
(Contracts NAS8-2686; AF 49(638)-991; AF 33(657)-10463) Avail: NTIS HC A07/MF A01 CSCL 21B

N78-10009# Advisory Group for Aerospace Research and Development, Paris (France).
ANALYSIS OF FLUID DYNAMICS OF SUPERSONIC COMBUSTION PROCESS CONTROLLED BY MIXING
Antonio Ferri and Herbert Fox *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 43-49 refs Presented at 12th Intern. Symp. on Combust. p 1105-1112 (For availability see N78-10005 01-01)
(Contract F33615-68-C-1114)
Avail: NTIS HC A07/MF A01

N78-10014*# Advisory Group for Aerospace Research and Development, Paris (France).
THE JET ENGINE DESIGN THAT CAN DRASTICALLY REDUCE OXIDES OF NITROGEN
Antonio Ferri and Anthony Agnone *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 79-88 refs Presented at 12th AIAA Aerospace Sci. Meeting, Wash., D. C., 30 Jan. - 1 Feb. 1974 (For availability see N78-10005 01-01)
(Grant NGR-33-016-131)
(AIAA-Paper-74-160) Avail: NTIS HC A07/MF A01 CSCL 21E

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N78-10111 Georgia Inst. of Tech., Atlanta.
AN ANALYSIS OF THE FLUTTER AND DAMPING CHARACTERISTICS OF HELICOPTER ROTORS Ph.D. Thesis
Sathy Padmanaban Viswanathan 1977 161 p
Avail: Univ. Microfilms Order No. 77-15044

Two relatively new methods of vibrational analysis of nonuniform rotor blades in combined flapwise bending and torsion are reviewed. The structural dynamic characteristics of an example blade are evaluated using the transmission matrix method and are later used in flutter analyses. An automated procedure is developed to obtain the matched flutter point of a rotor in an axial flight condition. The determinant method of flutter prediction turns out to be impracticable. The principles of the p-k method are explained and it is shown that this method is well suited to analyze the damping and flutter characteristics of rotor blades. An unsteady rotor aerodynamic theory of the p type is derived and the results from this analysis tend to show that the implied assumption of the p-k method is sound. Dissert. Abstr.

N78-10112*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SINGULAR PERTURBATIONS IN FLIGHT MECHANICS
Mark D. Ardema Jul. 1977 224 p refs Revised
(NASA-TM-X-62380; A-5706) Avail: NTIS HC A10/MF A01 CSCL 01C

The singular perturbation theory of ordinary differential equations was applied to optimal control problems in general and to trajectory optimization problems of flight mechanics in particular. A solution procedure employing the method of matched asymptotic expansions was developed and applied to the minimum time-to-climb problem. For the state regulator problem of optimal control theory, rigorous results were obtained which give conditions under which the method is applicable. The singular perturbation theory of nonlinear equations is reviewed and applied to optimal control problems. Outer, boundary layer, and composite solutions are obtained to zeroth and first orders. A stability criterion is derived for the zeroth order boundary layer solutions of this problem (the theory requires boundary layer stability). A numerical example is considered for which it is shown that the stability criterion is satisfied and a useful numerical solution is obtained. Author

N78-10113# Air Force Flight Test Center, Edwards AFB, Calif.
STABILITY AND CONTROL FLIGHT TEST TECHNIQUES, VOLUME 2 Final Report
Feb. 1977 128 p
(AD-A042593; AFFTC-TIH-77-1-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 01/3

Qualitative flight test techniques and data reduction methods used in pilot training courses at Edwards Air Force Base are presented in this handbook. Topics include: attitude flying, stalls, post-stall/spin, maneuverability, engine-out operations, longitudinal static stability, lateral direction, timing, trim changes, and dynamic stability. A.R.H.

N78-10114# Analytic Sciences Corp., Reading, Mass.
MODERN METHODS OF AIRCRAFT STABILITY AND CONTROL ANALYSIS Annual Technical Report, 1 Feb. 1976 - 31 Jan. 1977
Robert F. Stengel, John R. Broussard, Paul W. Berry, and James H. Taylor 25 May 1977 250 p refs
(Contract N00014-75-C-0432; RR0141184)
(AD-A043399; TASC-TR-612-2; ONR-CR-215-237-2) Avail: NTIS HC A11/MF A01 CSCL 01/2

This report presents new methodologies and results in the study of aircraft stability and control, including detailed consideration of piloting effects on the aircraft's motion. The potential for departure (i.e., loss of control) in transonic and supersonic flight is addressed using linear, time-invariant dynamic models which incorporate longitudinal-lateral-directional coupling. A method for designing departure-prevention command augmentation systems (DPCAS) is developed and is applied to the subsonic model of the F-14A aircraft. This design technique can provide excellent flying qualities for the aircraft throughout its flight envelope. A multivariable limit cycle analysis technique (MULCAT) is used to predict possible self-induced nonlinear oscillations, and the results of this prediction are evaluated using a direct simulation of the nonlinear dynamic model. GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N78-10115*# General Electric Co., Schenectady, N. Y. Applied Mechanics Branch.
AERO-ACOUSTIC EXPERIMENTAL VERIFICATION OF OPTIMUM CONFIGURATION OF VARIABLE-PITCH FANS FOR 40 X 80 FOOT SUBSONIC WIND TUNNEL Final Report
Harold Lown Aug. 1977 65 p refs
(Contract NAS2-8364)
(NASA-CR-152040; SRD-77-133) Avail: NTIS HC A04/MF A01 CSCL 14B

The aerodynamic and acoustic performance of two drive fan configurations (low-speed and high-speed variable pitch design) for a 40 x 80 foot wind tunnel were monitored. A 1/7-scale model was utilized. The necessary aero-acoustic data reduction computer program logic was supplied. Test results were

evaluated, and the optimum configuration to be employed in the 40 foot full scale fan was recommended. Author

N78-10116*# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
ACOUSTICAL PROPERTIES OF MATERIALS AND MUFFLER CONFIGURATIONS FOR THE 80 BY 120 FOOT WIND TUNNEL
Terry D. Scharton and Matthew D. Sneddon 25 Aug. 1977 70 p refs
(Contract NAS2-9549)
(NASA-CR-152065; Rept-3563) Avail: NTIS HC A04/MF A01 CSCL 14B

Techniques for measuring the impedance of the muffler configurations and of porous plates with grazing flow were investigated and changes in the configuration parameters to enhance acoustic performance are explored. The feasibility of a pulse reflection technique for measuring the impedance of built-up structures in situ was demonstrated. A second technique involving the use of an open-end impedance tube with grazing flow was used to obtain detailed design data for the perforated plate configuration. Acoustic benefits associated with configuration changes such as curving the baffles, spacing and staggering baffle partitions, and techniques for alleviating baffle self-generated noise are described. Author

N78-10117*# Systems Technology, Inc., Mountain View, Calif.
THE DETERMINATION OF SOME REQUIREMENTS FOR A HELICOPTER FLIGHT RESEARCH SIMULATION FACILITY
J. B. Sinacori Sep. 1977 59 p refs
(Contract NAS2-9421)
(NASA-CR-152066; TR-1097-1) Avail: NTIS HC A04/MF A01 CSCL 14B

Important requirements were defined for a flight simulation facility to support Army helicopter development. In particular requirements associated with the visual and motion subsystems of the planned simulator were studied. The method used in the motion requirements study is presented together with the underlying assumptions and a description of the supporting data. Results are given in a form suitable for use in a preliminary design. Visual requirements associated with a television camera/model concept are related. The important parameters are described together with substantiating data and assumptions. Research recommendations are given. Author

N78-10118# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
COLLECTION OF COMMERCIAL AIRCRAFT CHARACTERISTICS FOR STUDY OF RUNWAY ROUGHNESS Final Report
Anthony G. Gerardi May 1977 137 p refs
(Contract DOT-FA73WAI-361)
(AD-A042623/9; AFCEC-TR-75-23; FAA-RD-76-64) Avail: NTIS HC A07/MF A01 CSCL 01/5

Engineering data compatible with the computer program TAXI were collected for six commercial jet aircraft. These were the Boeing 707-320C, 727-200, and 747 and the McDonnell Douglas DC-8-63, DC-9-40 and the DC-10-10. The data were presented in the form required by TAXI. A simulation was made for each aircraft taking off from two separate airfields. The purpose of using two profiles was to point out the differences in aircraft response to different runway profiles. The calcomp plotted results are presented. A program users manual is also presented. A sample problem simulating a Boeing 707-320C during a constant speed taxi over a runway profile is included. All of the FORTRAN symbols used in TAXI are defined, and a complete listing of the program is contained in appendices A, B, C, and D. Appendix E contains airplane data representing a typical wide body tri-jet transport and two simulations using this data. Author

N78-10119# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
HIGH VELOCITY JET NOISE SOURCE LOCATION AND REDUCTION. TASK 1 SUPPLEMENT: CERTIFICATION OF THE GENERAL ELECTRIC JET NOISE ANECHOIC TEST FACILITY Final Report, Oct. 1975 - Mar. 1976
C. T. Savell 22 Feb. 1977 238 p refs
(Contract DOT-OS-30034)
(AD-A042327/7; R77AEG188-Suppl; FAA-RD-76-79-1-A-Suppl-1) Avail: NTIS HC A11/MF A01 CSCL 14/2

The operating limits of the facility are presented. The precision and accuracy of acoustic measurements were evaluated in terms of: (1) anechoic and far-field environment; (2) ambient levels in the chamber; (3) contamination from piping and combustors; (4) contamination from electronic noise floor; (5) variation of the frequency response of the data acquisition and reduction systems; (6) inaccuracies in aerodynamic instrumentation or fluctuations in the jet aeroconditions; and (7) precision errors in the air attenuation model due to environmental fluctuations, gradients, and measurement inaccuracies. The accuracy of the aerodynamic and acoustic instrumentation is excellent. The jet noise measurements were taken from circular conical nozzles, and were compared with classical referee data. Author

N78-10120# Transportation Research Board, Washington, D. C.
RESEARCH IN AIRPORT PAVEMENTS Special Report No. 175
May 1977 13 p Conf. held at Atlanta, 15-17 Nov. 1976 Sponsored by FAA
(AD-A043179; FAA-RD-77-101) Avail: NTIS HC A02/MF A01 CSCL 01/5

A conference on research in airport pavements was held to present the findings from recent research activities by FAA, to invite comments on the conclusions from these findings, and to address areas of future research needs. Research results that can now be implemented are in the following areas: (1) the pavement-aircraft compatibility study provides a basis for tradeoffs between aircraft and pavement design; (2) aircraft distribution on airport pavements can be reasonably defined for design and rehabilitation purposes; (3) mix design and construction procedures for fibrous concrete are adequate to permit its use where appropriate; (4) mix design and construction procedures are adequate for porous friction courses and performance data demonstrate their suitability for in-service use; (5) suitable equipment and procedures are available for measuring pavement unevenness; and (6) statistical quality control and quality assurance procedures are well defined for use in pavement construction and rehabilitation. Author

N78-10121*# Burroughs Corp., Paoli, Pa.
NUMERICAL AERODYNAMIC SIMULATION FACILITY PRELIMINARY STUDY: EXECUTIVE STUDY Final Report
Oct. 1977 25 p 2 Vol.
(Contract NAS2-9456)
(NASA-CR-152060) Avail: NTIS HC A02/MF A01 CSCL 14B

A computing system was designed with the capability of providing an effective throughput of one billion floating point operations per second for three dimensional Navier-Stokes codes. The methodology used in defining the baseline design, and the major elements of the numerical aerodynamic simulation facility are described. A.R.H.

N78-10122*# Burroughs Corp., Paoli, Pa.
NUMERICAL AERODYNAMIC SIMULATION FACILITY PRELIMINARY STUDY, VOLUME 1 Final Report
Oct. 1977 133 p refs 2 Vol.
(Contract NAS2-9456)
(NASA-CR-152061) Avail: NTIS HC A07/MF A01 CSCL 14B

A technology forecast was established for the 1980-1985 time frame and the appropriateness of various logic and memory technologies for the design of the numerical aerodynamic simulation facility was assessed. Flow models and their characteristics were analyzed and matched against candidate processor architecture. Metrics were established for the total facility, and housing and support requirements of the facility were identified. An overview of the system is presented, with emphasis on the hardware of the Navier-Stokes solver, which is the key element of the system. Software elements of the system are also discussed. A.R.H.

N78-10123*# Burroughs Corp., Paoli, Pa.
NUMERICAL AERODYNAMIC SIMULATION FACILITY

PRELIMINARY STUDY, VOLUME 2 AND APPENDICES Final Report
Oct. 1977 242 p 2 Vol.
(Contract NAS2-9456)
(NASA-CR-152062) Avail: NTIS HC A11/MF A01 CSCL 14B

Data to support results obtained in technology assessment studies are presented. Objectives, starting points, and future study tasks are outlined. Key design issues discussed in appendices include: data allocation, transposition network design, fault tolerance and trustworthiness, logic design, processing element of existing components, number of processors, the host system, alternate data base memory designs, number representation, fast div 521 instruction, architectures, and lockstep array versus synchronizable array machine comparison. A.R.H.

N78-10124# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
F-4E FIRE CONTROL SYSTEM SIMULATOR, F-4E AUSTERE/HEADS UP DISPLAY (HUD), SEAFAC PROGRAMS Final Report, 1 Apr. 1974 - 31 Dec. 1975
Walter Patterson Wright-Patterson AFB, Ohio AFAL May 1977 424 p
(Contract F33615-74-C-1173)
(AD-A042255; AFAL-TR-76-190) Avail: NTIS HC A18/MF A01 CSCL 19/5

This Final Phase A report covers two major task areas of this contract. One is the establishment and support of the Air Force-ASD/ENA Seafac Facilities in Building 485 at Wright-Patterson Air Force Base. The second task is the establishment and support of an F4E (aircraft 304) flight test program at the Air Force Flight Test Center for evaluating an Austere HUD in mission modes off air-to-air missile, air-to-ground weapons, and and air-to-air gunnery mechanizations. GRA

N78-10125# Naval Postgraduate School, Monterey, Calif.
WIND TUNNEL WALL CORRECTIONS FOR ARBITRARY PLANFORMS AND WIND TUNNEL CROSS-SECTIONS M.S. Thesis
Chester Arthur Heard Jun. 1977 76 p refs
(AD-A042299) Avail: NTIS HC A05/MF A01 CSCL 14/2

A computer program was developed to obtain the wind tunnel wall corrections for wing angle of attack, induced drag, and pitching moment in incompressible flow. The vortex lattice method is used for computation of these correction factors. The program can be applied to wind tunnels of arbitrary cross-sectional shape, and wings of any desired planform, subject to the constraint of straight leading and trailing edges. Author (GRA)

N78-10126# Naval Training Equipment Center, Orlando, Fla. Computer Lab.
COMPUTER SYSTEM REQUIREMENTS ANALYSIS DEVICE 2F112, F-14 WEAPON SYSTEM TRAINER Final Research Report, Jun. 1975 - Aug. 1976
Charles F. Summer, Jr., Gerald A. Wyndle, and David E. Daniel Apr. 1977 118 p refs
(AD-A043578; NAVTRAEQUIPC-IH-262) Avail: NTIS HC A06/MF A01 CSCL 09/2

This report documents the procedures and methodology used in determining the computer speed and storage requirements for Device 2F112 WST F-14A aircraft with a wide angle visual system. Three candidate computer systems are chosen for detailed analysis to determine the processing requirements. These requirements are best met using a multiple SEL 32/55 computer configuration. The information and data derived serve three basic needs: (a) Identification of total computer system requirements of a typical modern real-time simulator/training device; (b) Base-line requirements guidance for future trainer computer system architectural concepts being investigated in an in-house research task involving application of microprogramming techniques, microcomputer technology and high level languages; and (c) Delineation of the fundamental analysis procedural steps necessary to adequately evaluate and define computer system requirements for trainers. Author (GRA)

N78-10127# BDM Corp., McLean, Va.
BALLISTIC TEST FACILITY GUIDE Final Report, 1974 - 1975
B. E. Edney, R. T. Wagaman, D. A. Blottie, R. R. Shirley, and R. Chait May 1977 369 p Prepared in cooperation with RMC Research Corp., Bethesda, Md.
(Contracts DAAG46-76-C-0027; DAAG46-76-C-0009)
(AD-A043557; BDM/W-76; JTCG/AS-76-D-001) Avail: NTIS HC A16/MF A01 CSCL 14/2

This JTCG/AS Ballistic Test Facility Guide presents the results of an aircraft survivability test-oriented survey of 18 government and industry test facilities. In addition to description of actual ballistic test ranges, detailed information is presented on the types and sizes of projectiles which can be fired, instrumentation available, data processing capabilities, power/communication availability, safety and security arrangements, fabrication capability, logistics support availability, and facility access. Author (GRA)

N78-10128# General Accounting Office, Washington, D. C. Logistics and Communications Div.
USING AVIATION RESOURCES IN THE UNITED STATES MORE EFFICIENTLY
31 Mar. 1977 102 p
(PB-269464/4; LCD-76-445) Avail: NTIS HC A06/MF A01 CSCL 01E

There are 12,000 airfields in the United States and over 4,000 of these serve the general public and military community. The Federal Government spends millions annually to promote safety in the nation's airspace. A high concentration of federally operated airfields in some parts of the country such as California, Hawaii, and Virginia offer excellent potential to consolidate and share functions and facilities, make better use of Federal support of aviation, and reduce costs. GRA

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N78-10129*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROCEEDINGS OF THE SPACECRAFT CHARGING TECHNOLOGY CONFERENCE Interim Report
C. P. Pike, ed. and R. R. Lovell, ed. 24 Feb. 1977 885 p refs Conf. held at Colorado, 27-29 Oct. 1976; Sponsored by NASA and AFGL
(AF Proj. 7661)
(NASA-TM-X-73537; AFGL-TR-77-0051; AFSG-364) Avail: NTIS HC A99/MF A01 CSCL 22B

Over 50 papers from the spacecraft charging conference are included on subjects such as: (1) geosynchronous plasma environment, (2) spacecraft modeling, (3) spacecraft materials characterization, (4) spacecraft materials development, and (5) satellite design and test. For individual titles, see N78-10130 through N78-10182.

N78-10130*# Air Force Geophysics Lab., Hanscom AFB, Mass.
PROCEEDINGS OF THE SPACECRAFT CHARGING TECHNOLOGY CONFERENCE: EXECUTIVE SUMMARY **c18**
C. P. Pike, E. C. Whipple, Jr. (Calif. Univ., La Jolla), N. J. Stevens (NASA. Lewis Res. Center), M. L. Minges (AFML), W. L. Lehn (AFML), and M. H. Bunn (SAMSO) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 9-20 (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

Aerospace environments are reviewed in reference to spacecraft charging. Modelling, a theoretical scheme which can be used to describe the structure of the sheath around the spacecraft and to calculate the charging currents within, is discussed. Materials characterization is considered for experimental determination of the behavior of typical spacecraft materials when exposed to simulated geomagnetic substorm conditions. Materials development is also examined for controlling and minimizing spacecraft charging or at least for distributing the charge in an equipotential manner, using electrical conductive surfaces for materials exposed to space environment. J.A.M.

N78-10131*# Space and Missile Systems Organization, Los Angeles Air Force Station, Calif.
SPACECRAFT CHARGING TECHNOLOGY CONFERENCE, P 78-2, OVERVIEW
Douglas F. Shane *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 25-32 (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

Spacecraft charging technology is presented, including specifications and design. Mission objectives for launching the SAMSO 402 spacecraft are given to determine and analyze payload requirements. Engineering payloads, energy range of particle detectors, and orbital parameters are represented in graphical form. J.A.M.

N78-10132*# California Univ., La Jolla.
THE PLASMA ENVIRONMENT AT GEOSYNCHRONOUS ORBIT c46
Sherman E. DeForest *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 37-52 refs (For availability see N78-10129 01-12)
(Contract F19628-76-C-0214)
Avail: NTIS HC A99/MF A01 CSCL 22B

A two-fold objective is considered: (1) to present a picture of the magnetosphere about geosynchronous orbit to the nonspecialist, and (2) to introduce a preliminary model. Particle anisotropies from ATS 6 are included. Omnidirectional electron fluxes are also considered. J.A.M.

N78-10133*# Lockheed Missiles and Space Co., Palo Alto, Calif.
COMPOSITION OF THE HOT PLASMA NEAR GEOSYNCHRONOUS ALTITUDE c46
R. G. Johnson, R. D. Sharp, and E. G. Shelley *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 53-64 refs (For availability see N78-10129 01-12)
(Grant NSF DES-74-21834)
Avail: NTIS HC A99/MF A01 CSCL 04A

Although there were no direct measurements of the composition of the hot (keV) plasma at geosynchronous altitudes, the combination of other observations leads to the conclusion that, at least during geomagnetically disturbed periods, there are significant fluxes of ions heavier than protons in this region. Ion composition measurements below 8000 km altitude show upward streaming fluxes of both O(+) and H(+) ions in the L-region of the geosynchronous orbit. These observations are consistent with the conclusion that at least a portion of the total ion fluxes observed at geosynchronous altitude to be highly peaked near the magnetic field lines are heavier than protons and originate in the ionosphere. Author

N78-10134*# Air Force Geophysics Lab., Hanscom AFB, Mass.
INJUN 5 OBSERVATIONS OF VEHICLE POTENTIAL FLUCTUATIONS AT 2500 km c15
R. C. Sagalyn and William J. Burke (Regis Coll. Research Center, Weston, Mass.) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 67-80 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

The AFGL spherical electrostatic analyzers aboard the polar orbiting Injun 5 satellite were designed to measure the temperature and density of the plasma as well as the vehicle potential. Significant vehicle potential fluctuations were observed at altitudes near 2500 km in the nighttime, topside ionosphere. At auroral latitudes, precipitating magnetospheric electrons frequently drove the satellite to such strongly negative potentials that the ambient electrons were shielded from instruments. In such cases, simultaneous measurements can be used to calculate the vehicle potential. Potentials of up to -40 volts were observed during impulsive precipitation events. Within the plasma trough, vehicle potentials varied between -1.5 and -4 volts, as compared with the -0.5 to -1 volt observed in the polar cap. The source of this vehicle potential enhancement was ascribed to fluxes of photoelectrons that have escaped from the sunlit conjugate ionosphere. Author

N78-10135*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY REPORT ON THE CTS TRANSIENT EVENT COUNTER PERFORMANCE THROUGH THE 1976 SPRING ECLIPSE SEASON c16
N. John Stevens, Robert R. Lovell, and Vernon W. Klinect *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 81-105 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22A

The transient event counter is described, defining its operational characteristics, and presenting the preliminary results obtained through the first 90 days of operation including the Spring 1976 eclipse season. The results show that the CTS was charged to the point where discharges have occurred. The discharge induced transients have not caused any anomalous events in spacecraft operation. The data indicate that discharges can occur at any time during the day without preference to any local time quadrant. The number of discharges occurring in the 1 sec sample interval are greater than anticipated. Author

N78-10136*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACTIVE CONTROL OF SPACECRAFT CHARGING ON ATS-5 AND ATS-6 c15
Carolyn K. Purvis, Robert O. Bartlett (NASA. Goddard Space Flight Center), and Sherman E. DeForest (California Univ., La Jolla) *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 107-120 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

Effects on spacecraft ground potential of active emission of charged particles are being investigated through experiments using the ATS-5 and ATS-6 spacecraft. Each spacecraft is equipped with ion engine neutralizers which emit low energy charged particles. Despite great differences in design between the two spacecraft, they attain similar potentials in similar environments. Therefore, effects on spacecraft potential of neutralizer operations can be used to compare the effects of operating the two different neutralizers (hot wire filament and plasma bridge). The neutralizers on both spacecraft were operated in eclipse. Results of these operations are presented and spacecraft responses compared. Author

N78-10137*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ACTIVE CONTROL OF POTENTIAL OF THE GEOSYNCHRONOUS SATELLITES ATS-5 AND ATS-6 c15
Raymond Goldstein *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 121-129 refs (For availability see N78-10129 01-12)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 22B

The ATS-6 geosynchronous satellite carries two cesium ion thrusters as part of the technology experiment package. Their effectiveness in controlling the spacecraft potential was shown during normal operation of the thrusters. Auroral particle detectors were used to estimate spacecraft potential, amount of cesium propellant backflow to the spacecraft, and electron signature of the thruster. Operation of the thruster clamps the spacecraft to about -10 v in the presence of a wide range of ambient particle flux. Some positive ions from the thruster are returned to the spacecraft during this period. The plasma bridge neutralizer of the thruster is also effective in controlling the spacecraft potential. Laboratory simulation tests of the ATS-5 ion thruster thermionic emitter neutralizer showed that negative differential charging on the spacecraft surface probably prevents the emitter from completely discharging the spacecraft in flight. Author

N78-10138*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLASMA DISTRIBUTION AND SPACECRAFT CHARGING MODELING NEAR JUPITER c15
Raymond Goldstein and Neil Divine *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 131-141 refs (For availability see N78-10129 01-12)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 22B

To assess the role of spacecraft charging near Jupiter, the plasma distribution in Jupiter's magnetosphere was modeled using data from the plasma analyzer experiments on Pioneer 10

(published results) and on Pioneer 11 (preliminary results). In the model, electron temperatures are kT = 4 eV throughout, whereas proton temperatures range over 100 < or equal to kT < or equal to 400 eV. The model fluxes and concentrations vary over three orders of magnitude among several corotating regions, including, in order to increasing distance from Jupiter, a plasma void, plasma sphere, sporadic zone, ring current, current sheet, high latitude plasma and magnetosheath. Intermediate and high energy electrons and protons (to 100 MeV) are modeled as well. The models supply the information for calculating particle fluxes to a spacecraft in the Jovian environment. The particle balance equations (including effects of secondary and photoemission) then determine the spacecraft potential. Author

N78-10139*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ACTIVE SPACECRAFT POTENTIAL CONTROL SYSTEM SELECTION FOR THE JUPITER ORBITER WITH PROBE MISSION **c15**
John R. Beattie and Raymond Goldstein *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 143-166 refs (For availability see N78-10129 01-12)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 22B

It is shown that the high flux of energetic plasma electrons and the reduced photoemission rate in the Jovian environment can result in the spacecraft developing a large negative potential. The effects of the electric fields produced by this charging phenomenon are discussed in terms of spacecraft integrity as well as charged particle and fields measurements. The primary area of concern is shown to be the interaction of the electric fields with the measuring devices on the spacecraft. The need for controlling the potential of the spacecraft is identified, and a system capable of active control of the spacecraft potential in the Jupiter environment is proposed. The desirability of using this system to vary the spacecraft potential relative to the ambient plasma potential is also discussed. Various charged particle release devices are identified as potential candidates for use with the spacecraft potential control system. These devices are evaluated and compared on the basis of system mass, power consumption, and system complexity and reliability. Author

N78-10140*# Air Force Geophysics Lab., Hanscom AFB, Mass.
NUCLEAR BURST PLASMA INJECTION INTO THE MAGNETOSPHERE AND RESULTING SPACECRAFT CHARGING **c46**
A. L. Pavel, J. A. Cipolla (Northeastern Univ., Boston), M. B. Silevitch (Northeastern Univ., Boston), and K. I. Golden (Northeastern Univ., Boston) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 167-174 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 04A

The passage of debris from a high altitude (> 400 km) nuclear burst over the ionospheric plasma is found to be capable of exciting large amplitude whistler waves which can act to structure a collisionless shock. This instability will occur in the loss cone exits of the nuclear debris bubble, and the accelerated ambient ions will freestream along the magnetic field lines into the magnetosphere. Using Starfish-like parameters and accounting for plasma diffusion and thermalization of the propagating plasma mass, it is found that synchronous orbit plasma fluxes of high temperature electrons (near 10 keV) will be significantly greater than those encountered during magnetospheric substorms. These fluxes will last for sufficiently long periods of time so as to charge immersed bodies to high potentials and arc discharges to take place. Author

N78-10141*# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ELECTRIFICATION OF THE PROOF MASS OF A DRAG-FREE OR ACCELEROMETRIC SATELLITE **c15**
Remy Juillert and Jean-Pierre Philippon (Centre d'Etudes et de Recherches de Toulouse, France) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 175-190 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

The exploitation of the data provided by the Cactus accelerometer, which makes up the payload of the D5B Castor Satellite of CNES confirmed the existence of an electric current charging the proof mass under the influence of the magnetospheric protons, and revealed a periodic variation of this current, due to the passage of the apogee through the South Atlantic magnetic anomaly. Results of in-orbit measurements of this charging current are presented, as well as calculations made for determining this current and its variations from data on proton flux at the satellite altitudes. The comparison of measured and calculated values shows that the calculation method is valid and precise enough to be used for drag-free or accelerometric satellites. Author

N78-10142*# Air Force Geophysics Lab., Hanscom AFB, Mass.
ANALYSIS OF PENUMBRAL ECLIPSE DATA **c89**
H. B. Garrett *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 191-201 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 03A

Two days of data from the ATS-6 1976 eclipse season were analyzed to determine the effects of varying photoelectron flux on spacecraft potential. Particular emphasis was placed on the variation in potential as the satellite entered the earth's penumbra. Measurements from the AE-C satellite of the solar UV radiation were used to construct a model of atmospheric attenuation. This model was found to be consistent with direct measurements of the variations in photoelectron flux as Injun 5 passed into eclipse. Applying the model to the ATS-6 data gave the time dependency of the solar illumination/photoelectron flux as the satellite was eclipsed. This relationship, when combined with the ATS-6 measurements of satellite potential, revealed a nearly linear relation between the solar illumination/photoelectron flux and the logarithm of the satellite potential. Author

N78-10143*# European Space Agency, Noordwikj (Netherlands). Space Science Dept.
THE MULTIPLE APPLICATIONS OF ELECTRONS IN SPACE **c33**
Rejean J. L. Grard *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 203-221 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 09C

An electron source such as a simple cathode is a cheap and light device which can serve several technological and scientific purposes in space: (1) electrostatic charging of a spacecraft can be limited by releasing electrons accumulated on the conductive elements of their surface; (2) the erosion of conductive coatings and the ability of conductive paints to withstand the space environment can be evaluated by monitoring the flow of charged particles impinging on their surface; (3) measuring the current collected by the spacecraft surface as a function of its potential with respect to an emitter is a very sensitive diagnostic technique which can yield a number of plasma parameters, such as density and temperature; (4) it is possible to convert the thermal motion of space plasmas into electrical energy by collecting energetic electrons and returning them to the medium as cold particles; (5) a wave in a plasma is characterized by a conduction current density which gives rise to fluctuations of the current flowing to the surface. Author

N78-10144*# California Univ., La Jolla.
MODELING OF SPACECRAFT CHARGING **c15**
Elden C. Whipple, Jr. *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 225-235 refs (For availability see N78-10129 01-12)
(Grant NGL-05-005-007; Contract F19628-76-C-0214)
Avail: NTIS HC A99/MF A01 CSCL 22B

Three types of modeling of spacecraft charging are discussed: statistical models, parametric models, and physical models. Local time dependence of circuit upset for DoD and communication satellites, and electron current to a sphere with an assumed Debye potential distribution are presented. Four regions were involved in spacecraft charging: (1) undisturbed plasma, (2) plasma sheath region, (3) spacecraft surface, and (4) spacecraft equivalent circuit. J.A.M.

N78-10145*# General Electric Co., Philadelphia, Pa. Space Div.
A CHARGING MODEL FOR THREE-AXIS STABILIZED SPACECRAFT **c15**

M. J. Massaro, T. Green, and D. Ling *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 237-269 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

A charging model was developed for geosynchronous, three-axis stabilized spacecraft when under the influence of a geomagnetic substorm. The differential charging potentials between the thermally coated or blanketed outer surfaces and metallic structure of a spacecraft were determined when the spacecraft was immersed in a dense plasma cloud of energetic particles. The spacecraft-to-environment interaction was determined by representing the charged particle environment by equivalent current source forcing functions and by representing the spacecraft by its electrically equivalent circuit with respect to the plasma charging phenomenon. The charging model included a sun/earth/spacecraft orbit model that simulated the sum illumination conditions of the spacecraft outer surfaces throughout the orbital flight on a diurnal as well as a seasonal basis. Transient and steady-state numerical results for a three-axis stabilized spacecraft are presented. Author

N78-10146*# Battelle Pacific Northwest Labs., Richland, Wash.
INDUCED CHARGING OF SHUTTLE ORBITER BY HIGH ELECTRON-BEAM CURRENTS c16
H. B. Liemohn *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 271-286 refs (For availability see N78-10129 01-12)
(Contract NAS8-31415)
Avail: NTIS HC A99/MF A01 CSCL 22B

Emission of high-current electron beams that was proposed for some Spacelab payloads required substantial return currents to the orbiter skin in order to neutralize the beam charge. Since the outer skin of the vehicle was covered with approximately 1200 sq m of thermal insulation which has the dielectric quality of air and an electrical conductivity that was estimated by NASA at 10 to the -9 power to 10 to the -10 power mhos/m, considerable transient charging and local potential differences were anticipated across the insulation. The theory for induced charging of spacecraft due to operation of electron guns was only developed for spherical metal vehicles and constant emission currents, which were not directly applicable to the orbiter situation. Field-aligned collection of electron return current from the ambient ionosphere at orbiter altitudes provides up to approximately 150 mA on the conducting surfaces and approximately 2.4 A on the dielectric thermal insulation. Local ionization of the neutral atmosphere by energetic electron bombardment or electrical breakdown may provide somewhat more return current. Author

N78-10147*# Rockwell International Corp., Downey, Calif. Space Div.
AN ALTITUDE-DEPENDENT SPACECRAFT CHARGING MODEL c15
J. W. Haffner *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 287-296 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

A model for the altitude dependence of the hot plasma parameters responsible for the electrostatic charging of spacecraft was developed. Based upon plasma orbit theory, the directed velocity is a function of the ambient magnetic field flux density. A consequence of this approach is that while the thermal velocity distributions (assumed to be Maxwellian) of the plasma particles are independent of the magnetic field strength (and hence altitude), the particle densities increase with magnetic field strength. Thus, according to this model, while the equilibrium voltage is independent of altitude, the charging current density increases with decreasing altitude. However, the probability of such spacecraft charging decreases with decreasing altitude. Author

N78-10148*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
PIONEER VENUS SPACECRAFT CHARGING MODEL c15
P. A. Robinson, Jr. and A. B. Holman *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 297-308 refs (For availability see N78-10129 01-12)
(Contract NAS2-8300)
Avail: NTIS HC A99/MF A01 CSCL 22B

Five environmental models were constructed to represent the solar wind and the upper, middle, and lower ionosphere of Venus. The spacecraft structure was modeled with over 140 passive electrical elements representing structural elements of the spacecraft. Electron, ion, secondary electron, and photocurrents to the spacecraft from the plasma were calculated, ignoring sheath effects. In all but one case, potentials of interest were less than 1 volt. Potential differences between widely separated points on the equipment shelf were less than 1 mV. The one area of concern is the solar panel potential when the orbiter is passing through the bowshock region. Author

N78-10149*# Young (Arthur) and Co., Bethesda, Md. Physics Dept.
NUMERICAL SIMULATION OF SPACECRAFT CHARGING PHENOMENA c14
J. G. Laframboise and S. M. L. Prokopenko *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 309-318 refs (For availability see N78-10129 01-12)
(Grant AF-AFOSR-2962-76)
Avail: NTIS HC A99/MF A01 CSCL 12A

A numerical simulation program is being constructed having the following features: (1) infinite circular cylindrical geometry with angle-dependence, (2) inclusion of incident particles, photoelectrons, secondary electrons, backscattered electrons, any gun emissions, and any internal current pathways including surface conductive layers, (3) quasistatic time-dependent iteration, in which sheath potential changes during particle transit times are ignored, (4) use of approximate, locally-dependent space charge density expressions in solving Poisson's equation for sheath potentials, with use of numerical orbit-following to determine surface currents, and (5) incident particle velocity distributions isotropic or beam-like, or some superposition of these. Rationales for each of these features are discussed. Author

N78-10150*# Systems Science and Software, La Jolla, Calif. Plasma Physics Group.
DYNAMIC MODELING OF SPACECRAFT IN A COLLISIONLESS PLASMA c15
Ira Katz, Donald E. Parks, Sang Wang, and Andrew Wilson *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 319-330 refs (For availability see N78-10129 01-12)
(Contracts NAS3-20119; DNA001-76-C-0121)
Avail: NTIS HC A99/MF A01 CSCL 22B

A new computational model is described which can simulate the charging of complex geometrical objects in three dimensions. Two sample calculations are presented. In the first problem, the capacitance to infinity of a complex object similar to a satellite with solar array paddles is calculated. The second problem concerns the dynamical charging of a conducting cube partially covered with a thin dielectric film. In this calculation, the photoemission results in differential charging of the object. Author

N78-10151*# Parker (Lee W.), Inc., Concord, Mass.
CALCULATION OF SHEATH AND WAKE STRUCTURE ABOUT A PILLBOX-SHAPED SPACECRAFT IN A FLOWING PLASMA c15
Lee W. Parker *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 331-366 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

A computer program was used for studies of the disturbed zones around bodies in flowing plasmas, particularly spacecraft and their associated sheaths and wakes. The program solved a coupled Poisson-Vlasov system of nonlinear partial differential integral equations to obtain distributions of electric potential and ion and electron density about a finite length cylinder in a plasma flow at arbitrary ion Mach numbers. The approach was applicable to a larger range of parameters than other available approaches. In sample calculations, bodies up to 100 Debye lengths in radius were treated, that is, larger than any previously treated realistically. Applications were made to in-situ satellite experiments. Author

N78-10152*# Young (Arthur) and Co., Bethesda, Md. Physics Dept.

PREDICTION OF LARGE NEGATIVE SHADED-SIDE SPACECRAFT POTENTIALS **c33**

S. M. L. Prokopenko and J. G. Laframboise *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 369-387 refs (For availability see N78-10129 01-12)

(Grant AF-AFOSR-2962-76)

Avail: NTIS HC A99/MF A01 CSCL 09C

A calculation by Knott, for the floating potential of a spherically symmetric synchronous-altitude satellite in eclipse, was adapted to provide simple calculations of upper bounds on negative potentials which may be achieved by electrically isolated shaded surfaces on spacecraft in sunlight. Large (approximately 60 percent) increases in predicted negative shaded-side potentials are obtained. To investigate effective potential barrier or angular momentum selection effects due to the presence of less negative sunlit-side or adjacent surface potentials, these expressions were replaced by the ion random current, which is a lower bound for convex surfaces when such effects become very severe. Further large increases in predicted negative potentials were obtained, amounting to a doubling in some cases. Author

N78-10153*# Air Force Geophysics Lab., Hanscom AFB, Mass.

A SIMULATION MODEL OF TIME-DEPENDENT PLASMA-SPACECRAFT INTERACTIONS **c15**

P. L. Rothwell, A. G. Rubin, and G. K. Yates *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 389-411 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 22B

A plasma simulation code is presented that models the time-dependent plasma properties in the vicinity of a spherical, charged spacecraft. After showing agreement with analytic, steady-state theories and ATS-6 satellite data, the following three problems are treated: (1) transient pulses from photoemission at various emission temperatures and ambient plasma conditions, (2) spacecharge limited emission, and (3) simulated plasma oscillations in the long wavelength limit. Author

N78-10154*# Lunar Science Inst., Houston, Tex.

PHOTOELECTRIC CHARGING OF PARTIALLY SUNLIT DIELECTRIC SURFACES IN SPACE **c15**

Bibhas R. De and David R. Criswell *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 413-421 refs (For availability see N78-10129 01-12)

(Contract NSR-09-051-001)

Avail: NTIS HC A99/MF A01 CSCL 22B

Sunlight-shadow effects may substantially alter the charging situation for a dielectric surface. The sunlight-shadow boundary tends to be the site of intense multipole electric fields. Charges on a sunlit dielectric surface have a finite effective mobility. The charge distribution tends to resemble that on a conducting surface. A boundary between a conducting and a dielectric surface may not represent a conductivity discontinuity when this boundary is sunlit; charges may migrate at a nontrivial rate across the boundary. A contracting or expanding sunlit area may experience a supercharging. Author

N78-10155*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE LEWIS RESEARCH CENTER GEOMAGNETIC SUBSTORM SIMULATION FACILITY **c14**

Frank D. Berkopec, N. John Stevens, and John C. Sturman *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 423-430 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 14B

A simulation facility was established to determine the response of typical spacecraft materials to the geomagnetic substorm environment and to evaluate instrumentation that will be used to monitor spacecraft system response to this environment. Space environment conditions simulated include the thermal-vacuum conditions of space, solar simulation, geomagnetic substorm electron fluxes and energies, and the low energy plasma environment. Measurements for spacecraft material tests include sample currents, sample surface potentials, and the cumulative number of discharges. Discharge transients are measured by means of current probes and oscilloscopes and are verified by a photomultiplier. Details of this facility and typical operating procedures are presented. Author

N78-10156*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TESTING OF TYPICAL SPACECRAFT MATERIALS IN A SIMULATED SUBSTORM ENVIRONMENT **c18**

N. John Stevens, Frank D. Berkopec, John V. Staskus, Richard A. Blech, and Steven J. Narciso *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 431-457 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 11G

The test specimens were spacecraft paints, silvered Teflon, thermal blankets, and solar array segments. The samples, ranging in size from 300 to 1000 sq cm were exposed to monoenergetic electron energies from 2 to 20 keV at a current density of 1 NA/sq cm. The samples generally behaved as capacitors with strong voltage gradient at their edges. The charging characteristics of the silvered Teflon, Kapton, and solar cell covers were controlled by the secondary emission characteristics. Insulators that did not discharge were the spacecraft paints and the quartz fiber cloth thermal blanket sample. All other samples did experience discharges when the surface voltage reached -8 to -16kV. The discharges were photographed. The breakdown voltage for each sample was determined and the average energy lost in the discharge was computed. Author

N78-10157*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CHARGING CHARACTERISTICS OF MATERIALS: COMPARISON OF EXPERIMENTAL RESULTS WITH SIMPLE ANALYTICAL MODELS **c26**

Carolyn K. Purvis, N. John Stevens, and Jon C. Oglebay *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 459-486 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 11G

A one-dimensional model for charging of samples is used in conjunction with experimental data taken to develop material charging characteristics for silvered Teflon. These characteristics are then used in a one dimensional model for charging in space to examine expected response. Relative charging rates as well as relative charging levels for silvered Teflon and metal are discussed. Author

N78-10158*# European Space Technology Center, Noordwijk (Netherlands).

INVESTIGATION OF A CTS SOLAR CELL TEST PATCH UNDER SIMULATED GEOMAGNETIC SUBSTORM CHARGING CONDITIONS **c44**

K. P. Bogus *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 487-501 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 10A

The CTS solar array technology experiment which consists of a solar cell test patch on the Kapton-substrate solar array and the appertaining electronics unit has been operating in geostationary orbit for nearly 1 year without any malfunction although it is expected to be strongly influenced by charging effects on the array surface. The results of a post-launch test program show that the experiment would not survive a discharge due to electrostatic charging in the test patch area. In a simulated substorm, environment discharges were obtained only below a temperature threshold of about 30 C. With solar illumination, this threshold is reduced below 0 C. Author

N78-10159*# Pennsylvania State Univ., University Park. Electrical Engineering Dept.

CHARGE DISTRIBUTIONS NEAR METAL-DIELECTRIC INTERFACES BEFORE AND AFTER DIELECTRIC SURFACE FLASHOVER **c33**

James W. Robinson *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging-Technol. Conf. 24 Feb. 1977 p 503-717 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 09C

A technique was developed for measuring surface charge distribution near interfaces without placing any measuring apparatus near the face of the samples. The results of measurements which were made on FEP Teflon and Kapton dielectrics,

before and after are given flashover, with various types of interfaces. Also given are data showing mean time between flashovers for various configurations exposed to a variety of environmental conditions. Several charge transfer mechanisms are considered as a means by which stable charge distributions may be maintained near interfaces. Author

N78-10160*# Toronto Univ. (Ontario). Dept. of Electrical Engineering.

SURFACE MICRO-DISCHARGES ON SPACECRAFT DIELECTRICS **c33**

K. G. Balmain, M. Cuchanski, and P. C. Kremer *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 519-526 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 09C

Extensive measurements on Teflon and Kapton in a scanning electron microscope indicate the existence of a well-defined family of surface micro-discharges characteristic of the dielectric material. For a given small region exposed to the 16-20 kV electron beam, the strongest discharge pulses are similar in shape and amplitude. For Teflon, typical pulse durations are 2-3 ns, rise and fall times are sometimes as low as 0.2 ns, current amplitudes are approximately 100 mA flowing down to the pedestal and the pulses are unidirectional with no ringing. The use of a rapid-scan electron microscope with a secondary-electron imaging system reveals complex charge distributions resembling Lichtenberg figures on a supposedly flat homogeneous dielectric surface. These patterns undergo extensive alteration at each micro-discharge pulse and indicate that both the charging and discharging processes are highly nonuniform over the dielectric surface. The use of floodbeam causes the occurrence of a large-scale macro-discharges, in which a typical peak current is 40 A with a duration of 120 ns. Author

N78-10161*# TRW Defense and Space Systems Group, Redondo Beach, Calif.

SURGE CURRENT AND ELECTRON SWARM TUNNEL TESTS OF THERMAL BLANKET AND GROUND STRAP MATERIALS **c33**

D. K. Hoffmaster, G. T. Inouye, and J. M. Sellen, Jr. *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 527-547 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 09C

The results are described of a series of current conduction tests with a thermal control blanket to which grounding straps have been attached. The material and the ground strap attachment procedure are described. The current conduction tests consisted of a surge current examination of the ground strap and a dilute flow, energetic electron deposition and transport through the bulk of the insulating film of this thermal blanket material. Both of these test procedures were used previously with thermal control blanket materials. Author

N78-10162*# Stanford Research Inst., Menlo Park, Calif. Electromagnetic Sciences Lab.

A RUGGED ELECTRON/ION SOURCE FOR SPACECRAFT CHARGING EXPERIMENTS **c33**

J. E. Nanevicz and R. C. Adamo *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 549-555 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 09C

A simple, novel technique was developed for generating a large-diameter, uniform electron beam with appropriate current density for spacecraft charging studies. Author

N78-10163*# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

CONDUCTIVE SPACECRAFT MATERIALS DEVELOPMENT PROGRAM **c23**

William L. Lehn *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 559-567 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 11G

The objectives of this program are to provide design criteria, techniques, materials, and test methods to ensure control of absolute and differential charging of spacecraft surfaces. The control of absolute and differential charging of spacecraft cannot be effected without the development of new and improved or modified materials or techniques that will provide electrical continuity over the surface of the spacecraft. The materials' photoemission, secondary emission, thermooptical, physical, and electrical properties in the space vacuum environment both in the presence and absence of electrical stress and ultraviolet, electron, and particulate radiation, are important to the achievement of charge control. The materials must be stable or have predictable response to exposure to the space environment for long periods of time. The materials of interest include conductive polymers, paints, transparent films and coatings as well as fabric coating interweaves. Author

N78-10164*# Rome Air Development Center, Hanscom AFB, Mass. Solid State Sciences Div.

RESULTS OF LITERATURE SEARCH ON DIELECTRIC PROPERTIES AND ELECTRON INTERACTION PHENOMENA RELATED TO SPACECRAFT CHARGING **c33**

J. A. Wall, E. A. Burke, and A. R. Frederickson *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 569-591 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 09C

The objective of the literature search was to determine the required material properties and electron interaction parameters needed for modeling charge buildup and breakdown in insulators. A brief overview of the results of the literature search is given. A partial list of the references covered is included in a bibliography. Although inorganic insulators were also considered in the search, coverage is limited to the organics, primarily Kapton and Teflon. Author

N78-10165*# IIT Research Inst., Chicago, Ill.

ELECTRICALLY CONDUCTIVE PAINTS FOR SATELLITES **c27**

J. E. Gilligan, R. E. Wolf (Desota, Inc.), and C. Ray (Desota, Inc.) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 593-611 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 11G

A program was conducted to develop and test electrically conductive paint coatings for spacecraft. A wide variety of organic and inorganic coatings were formulated using conductive binders, conductive pigments, and similar approaches. Z-93, IITRI's standard specification inorganic thermal control coating, exhibits good electrical properties and is a very space-stable coating system. Several coatings based on a conductive pigment (antimony-doped tin oxide) in silicone and silicate binders offer considerable promise. Paint systems using commercially available conductive polymers also appear to be of interest, but will require substantial development. Evaluations were made based on electrical conductivity, paint physical properties, and the stability of spectral reflectance in space environment testing. Author

N78-10166*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

FORMULATION OF ELECTRICALLY CONDUCTIVE, THERMAL-CONTROL COATINGS **c27**

Michael C. Shai *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 613-620 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 11G

Formulation of electrically conductive, thermal-control coatings was undertaken for use on the International Sun Earth Explorer (ISEE) spacecraft. Unsuccessful formulation efforts as well as the successful use of oxide pigments fired at 1175 C are described. Problems attributed to reactivity of specific coating vehicles exposed to high humidity are discussed. Measurement and testing methods, including resulting data are mentioned, but the emphasis, in this report, is placed on coating formulation and application techniques. Methods of varying, as desired, optical properties are also described as well as formulations of white, low-absorptance coatings. Author

N78-10167*# General Electric Co., Philadelphia, Pa. Space Div.

MATERIALS AND TECHNIQUES FOR SPACECRAFT STATIC CHARGE CONTROL **c27**

L. J. Amore and A. E. Eagles *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 621-654 refs (For availability see N78-10129 01-12)
(Contracts F33615-76-C-5075; F33615-76-C-5258)
Avail: NTIS HC A99/MF A01 CSCL 11G

An overview of the design, development, fabrication, and testing of transparent conductive coatings and conductive lattices deposited or formed on high resistivity spacecraft dielectric materials to obtain control static charge buildup on spacecraft external surfaces is presented. Fabrication techniques for the deposition of indium/tin oxide coatings and copper grid networks on Kapton and FEP Teflon films and special frit coatings for OSR and solar cell cover glasses are discussed. The techniques include sputtering, photoetching, silkscreening, and mechanical processes. A facility designed and built to simulate the electron plasma at geosynchronous altitudes is described along with test procedures. The results of material characterizations as well as electron irradiation aging effects in this facility for spacecraft polymers treated to control static charge are presented. The data presents results for electron beam energies up to 30 kV and electron current densities of 30 nA/cm squared. Parameters measured include secondary emission, surface leakage, and through the sample currents as a function of primary beam energy and voltage. Author

N78-10168*# General Electric Co., Philadelphia, Pa. Space Div.
SECONDARY EMISSION CONDUCTIVITY OF HIGH PURITY SILICA FABRIC **c27**
V. J. Belanger and A. E. Eagles *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 655-686 refs (For availability see N78-10129 01-12)
(Contract F33615-C-75-5267)
Avail: NTIS HC A99/MF A01 CSCL 11G

High purity silica fabrics were proposed for use as a material to control the effects of electrostatic charging of satellites at synchronous altitudes. These materials exhibited very quiet behavior when placed in simulated charging environments as opposed to other dielectrics used for passive thermal control which exhibit varying degrees of electrical arcing. Secondary emission conductivity is proposed as a mechanism for this superior behavior. Design of experiments to measure this phenomena and data taken on silica fabrics are discussed as they relate to electrostatic discharge (ESD) control on geosynchronous orbit spacecraft. Studies include the apparent change in resistivity of the material as a function of the electron beam energy, flux intensity, and the effect of varying electric fields impressed across the material under test. Author

N78-10169*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INVESTIGATION OF CONDUCTIVE THERMAL CONTROL COATINGS BY A CONTACTLESS METHOD IN VACUO **c27**
W. Viehmann, C. M. Shai, and E. L. Sanford *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 687-698 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 11G

A technique for determining the conductance per unit area of thermal control coatings for electrostatically clean spacecraft is described. In order to simulate orbital conditions more closely, current-density-voltage (j-V) curves are obtained by a contactless method in which the paint on an aluminum substrate is the anode of a vacuum diode configuration with a tungsten filament cathode. Conductances per unit area which satisfy the International Sun Earth Explorer (ISEE) requirement were observed on black paints containing carbon and in white and green paints filled with zinc oxide which were fired in order to induce defect conductivity. Because of surface effects and the nonhomogeneous nature of paints, large discrepancies were found between measurements with the contactless method and measurements employing metallic contacts, particularly at low current densities. Therefore, measurements with metallic contacts are considered to be of questionable value in deciding the suitability of coatings for electrostatic charge control. Author

N78-10170*# Lockheed Missiles and Space Co., Palo Alto, Calif.
THE EFFECTS OF THE GEOSYNCHRONOUS ENERGETIC PARTICLE RADIATION ENVIRONMENT ON SPACECRAFT CHARGING PHENOMENA **c46**
J. B. Reagan, W. L. Imhof, and E. E. Gaines *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 701-713 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 04A

The energetic electron environment at the geosynchronous orbit is responsible for a variety of adverse charging effects on spacecraft components. The most serious of these is the degradation and failure of a complementary-metal-oxide-semiconductor (CMOS) electronic components as a result of internal charge-buildup induced by the energetic electrons. Efforts to accurately determine the expected lifetime of these components in this orbit are hampered by the lack of detailed knowledge of the electron spectrum and intensity, particularly of the more penetrating energies greater than 1.5 MeV. This problem is illustrated through the calculation of the dose received by a CMOS device from the energetic electrons and associated bremsstrahlung as a function of aluminum shielding thickness using the NASA AE-6 and the Aerospace measured electron environments. Two computational codes which were found to be in good agreement were used to perform the calculations. For a given shielding thickness the dose received with the two radiation environments differ by as much as a factor of seven with a corresponding variation in lifetime of the CMOS. Author

N78-10171*# Aerospace Corp., El Segundo, Calif.
SYSTEM ASPECTS OF SPACECRAFT CHARGING **c15**
S. P. Bower *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 719-721 (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

Satellites come in a variety of sizes and configurations including spinning satellites and three-axis stabilized satellites. All of these characteristics have a significant effect on spacecraft charging considerations. There are, however, certain fundamentals which can be considered which indicate the nature and extent of the problem. The global positioning system satellite serves to illustrate certain characteristics. Author

N78-10172*# Stanford Research Inst., Menlo Park, Calif. Electromagnetic Sciences Lab.
TRANSIENT RESPONSE MEASUREMENTS ON A SATELLITE SYSTEM **c15**
J. E. Nanevicz and R. C. Adamo *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 723-734 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

A set of instruments designed to detect the occurance of electrical breakdown was flown on a synchronous-orbit satellite. The LeRC sensors were installed on cables inside the vehicle. Accordingly, they respond to signals coupled into the satellite wiring system. The SRI sensors were located on the exterior of the vehicle and detected the RF noise pulses associated with surface breakdowns. The results of the earlier SRI program are being used to design and develop a set of intrumentation suitable for inclusion as a general piggy-back package for the detection of the onset of satellite charging and breakdowns on synchronous orbit satellites. Author

N78-10173*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROVISIONAL SPECIFICATION FOR SATELLITE TIME IN A GEOMAGNETIC ENVIRONMENT **c13**
N. John Stevens, Robert R. Lovell, and Carolyn K. Purvis *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 735-744 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

Satellites in geosynchronous orbit were experiencing operational anomalies. These anomalies are believed to be due to the environment charging the spacecraft surfaces to a point where discharges occur. In designing future satellites for long term operation at geosynchronous altitude, it is important that designers have a specification that will give the total time per

year, the particle flux density and particle energies that their satellites can be expected to encounter in these substorm environmental conditions. The limited data currently available on the environmental conditions are used to generate the provisional specification given in this report. Author

N78-10174*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEVELOPMENT OF ENVIRONMENTAL CHARGING EFFECT MONITORS FOR OPERATIONAL SATELLITES **c15**
N. John Stevens, John C. Sturman, and Frank D. Berkopec *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 745-751 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

Design details and design goals are given of an instrumentation package to monitor the effects of the environmental charging of spacecraft surfaces on the systems of operational spacecraft. Author

N78-10175*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VIKING AND STP P78-2 ELECTROSTATIC CHARGING DESIGNS AND TESTING **c15**
R. O. Lewis, Jr. *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 753-772 Lakewood, Colo. (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

The design provisions of the Viking and the P78-2 (SCATHA) vehicles and a mathematical analysis of the effect of arcing on typical interface circuits are given. Results of verification testing of the analysis are presented as well as vehicle testing for tolerance to arcing. Author

N78-10176*# Communications Research Centre, Ottawa (Ontario). Dept. of Communications.
DESIGN, CONSTRUCTION AND TESTING OF THE COMMUNICATIONS TECHNOLOGY SATELLITE PROTECTION AGAINST SPACECRAFT CHARGING **c15**
J. Victor Gore *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 773-788 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

Detailed discussions are presented of the measures taken on the Communications Technology Satellite (CTS or Hermes) which provide protection against the effects of spacecraft charging. These measures include: a comprehensive grounding philosophy and implementation; provision of command and data line transmitters and receivers for transient noise immunity; and a fairly restrictive EMI specification. Ground tests were made on materials and the impact of these tests on the CTS spacecraft is described. Hermes, launched on 17 January 1976 on a 2914 Delta vehicle, has successfully completed 10 months of operations. Anomalies observed are being assessed in relation to spacecraft charging, but no definite correlations have yet been established. A list of conclusions with regard to the CTS experience is given and recommendations for future spacecraft are also listed. Author

N78-10177*# General Electric Co., Philadelphia, Pa.
COMMON APPROACH TO SOLVING SGEMP, DEMP, AND ESD SURVIVABILITY **c15**
D. Ling *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 789-803 (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

System Generated Electromagnetic Pulse (SGEMP) and Dispersed Electromagnetic Pulse DEMP) are nuclear generated spacecraft environments. Electrostatic discharge (ESD) is a natural spacecraft environment resulting from differential charging in magnetic substorms. All three phenomena, though differing in origin, result in the same problem to the spacecraft and that is Electromagnetic Interference (EMI). A common design approach utilizing a spacecraft structural Faraday Cage is presented which helps solve the EMI problem. Also, other system design techniques are discussed which minimize the magnitude of these environments through control of materials and electrical grounding configuration. Author

N78-10178*# General Electric Co., Philadelphia, Pa.
PLASMA CHARGING TESTING OF COMMUNICATION SATELLITES **c32**
F. Rosen *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 805-813 (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 20N

A discussion is given of ESD as a radiated electromagnetic environment and compares the ESD environment to a standard EMI test environment. An arc generator used to assess the sensitivity of typical spacecraft electronics is described. The results of radiated susceptibility tests conducted on breadboard circuits and a satellite electrical model of a communication satellite are discussed. Author

N78-10179*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
QUALIFICATION MODEL SPACECRAFT TESTS FOR DEMP, SGEMP, AND ESD EFFECTS **c32**
E. Paul Chivington, Peter J. Madle, and Peter H. Stadler (SAMSO, Los Angeles Air Force Station, Calif.) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 815-828 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 20N

The development of a satellite design demonstration test program is described. The test approach is comprehensive in that it includes the effects from electrostatic discharge (ESD), system generated electromagnetic pulse (SGEMP), as well as dispersed electromagnetic pulses (DEMP). The comprehensive test concept is based on the similarity of the satellite's response to several environments. Author

N78-10180*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
SPACECRAFT CHARGING ANOMALIES ON THE DSCS II, LAUNCH 2 SATELLITES **c15**
George T. Inouye *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 829-852 refs (For availability see N78-10129 01-12)
(Contract F04701-69-C-0091)
Avail: NTIS HC A99/MF A01 CSCL 22B

The six different types of anomalous events occurred on two DSCS II satellites. The total number of events, over 100, and the long operational period, nearly 3 years, permits some statistical analyses to be performed. Correlation of occurrences of particular types of anomalies with equinoxes and seasons of the year are consistent with a spacecraft charging model. On the other hand, an interesting correlation of occurrences with days of the week has been found. Finally, a long term diminution in the frequency of occurrence of events has been observed, and is discussed in terms of environmental activity, material degradations and the need for more data. Author

N78-10181*# Royal Aircraft Establishment, Farnborough (England).
SPACE ENVIRONMENTAL EFFECTS ON THE SKYNET 2B SPACECRAFT **c15**
A. Robbins and C. D. Short *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 853-863 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

References are made to environmentally induced electrical anomalies which are known to occur on geosynchronous spacecraft, and in particular to those which have occurred on the SKYNET 2B communications spacecraft. Details are given of the investigation made into anomalous telemetry data received from SKYNET 2B during its first 23 months of operation. The frequency and timing of these anomalous events appear to differ from those described in earlier reports of such phenomena. Attempts are made to correlate the anomalous telemetry data with data describing the spacecraft environment. Some details are given of the spacecraft configuration and comments made on its susceptibility to anomalies of this type. Author

N78-10182*# RCA American Communications, Inc., Piscataway, N. J.
RCA SATCOM 3-AXIS SPACECRAFT EXPERIENCE AT GEOSYNCHRONOUS ALTITUDE **c15**

Joseph Napoli and Joseph Seliga (RCA Astro-Electronics Div.) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 865-871 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

The RCA Satcom space segment presently consists of two three-axis stabilized communication satellites which have been in orbit at geosynchronous altitudes for 11 and 8 months respectively. Both satellites have experienced two eclipse seasons since the beginning of operations. Neither spacecraft has exhibited any anomalous behavior that can be attributed to the effects of spacecraft charging. A brief discussion of the history, spacecraft characteristics and design techniques is presented.
Author

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N78-10183*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
A COMPUTER PROGRAM FOR AN ANALYSIS OF THE RELATIVE MOTION OF A SPACE STATION AND A FREE FLYING EXPERIMENT MODULE
J. H. Butler Jul. 1971 108 p refs
(Contract NAS8-20082)
(LMSC-HREC-D162646; LMSC-TM-54/30-237) Avail: NTIS HC A06/MF A01 CSCL 22A

A preliminary analysis of the relative motion of a free flying experiment module in the vicinity of a space station under the perturbative effects of drag and earth oblateness was made. A listing of a computer program developed for determining the relative motion of a module utilizing the Cowell procedure is presented, as well as instructions for its use.
Author

N78-10184*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
THIRD-ORDER SOLUTION OF AN ARTIFICIAL-SATELLITE THEORY
Hiroshi Kinoshita 27 Jul. 1977 105 p refs
(Grant NGR-09-015-002)
(NASA-CR-154509; SAO-SR-379) Avail: NTIS HC A06/MF A01 CSCL 22A

A third-order solution was developed for the motions of artificial satellites moving in the gravitational field of the earth, whose potential includes the second-, third-, and fourth-order zonal harmonics. Third-order periodic perturbations with fourth-order secular perturbations were derived by the Hori perturbation method. All quantities were expanded into power series of the eccentricity, but the solution was obtained so as to be closed with respect to the inclination. A comparison with the results of numerical integration of the equations of motion indicates that the solution can predict the position of a close-earth, small-eccentricity satellite with an accuracy of better than one cm over a period of one month.
Author

N78-10173*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROVISIONAL SPECIFICATION FOR SATELLITE TIME IN A GEOMAGNETIC ENVIRONMENT
N. John Stevens, Robert R. Lovell, and Carolyn K. Purvis *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 735-744 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N78-10149*# Young (Arthur) and Co., Bethesda, Md. Physics Dept.
NUMERICAL SIMULATION OF SPACECRAFT CHARGING PHENOMENA
J. G. Laframboise and S. M. L. Prokopenko *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 309-318 refs (For availability see N78-10129 01-12)
(Grant AF-AFOSR-2962-76)
Avail: NTIS HC A99/MF A01 CSCL 12A

N78-10155*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE LEWIS RESEARCH CENTER GEOMAGNETIC SUB-STORM SIMULATION FACILITY
Frank D. Berkopec, N. John Stevens, and John C. Sturman *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 423-430 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 14B

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N78-10185*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE STATION SYSTEMS ANALYSIS STUDY. PART 3: DOCUMENTATION. VOLUME 7: SCB ALTERNATE EPS EVALUATION, TASK 10
Sep. 1977 344 p refs
(Contract NAS9-14958)
(NASA-CR-151535; MDC-G6954-Pt-3-Vol-7) Avail: NTIS HC A15/MF A01 CSCL 22A

Power levels up to 100 kWe average were baselined for the electrical power system of the space construction base, a long-duration manned facility capable of supporting manufacturing and large scale construction projects in space. Alternatives to the solar array battery systems discussed include: (1) solar concentrator/brayton; (2) solar concentrator/thermionic; (3) isotope/brayton; (4) nuclear/brayton; (5) nuclear thermoelectric; and (6) nuclear thermionic.
Author

N78-10186*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PARAMETRIC STUDY OF ASCENT PERFORMANCE OF A VERTICALLY LAUNCHED HYDROGEN-FUELED SINGLE-STAGE REUSABLE TRANSPORT
John J. Rehder 1977 41 p refs
(NASA-TP-1045) Avail: NTIS HC A03/MF A01 CSCL 22A

Ascent performance characteristics were studied for a vertical-take-off, horizontal-landing, single-stage-to-orbit transport vehicle powered by hydrogen fuel rocket with a mixture of fixed- and dual-position nozzles. The analysis was made by systematically varying two sets of trajectory similarity parameters based on the propulsive and aerodynamic characteristics of the vehicle and by calculating a trajectory for each combination of the parameters. The propulsion parameters were the initial thrust-weight ratio, engine combination, and the two expansion ratios of the dual-position rocket nozzles. The aerodynamic parameters were the ratio of reference area to initial weight and the ratio of maximum allowable normal force to initial weight. A first-order analysis was carried out to determine the effect on the

performance of including the engine mass penalty. This analysis indicates that the configuration with the lowest initial mass for a given payload requires all dual-position nozzles with initial expansion ratio of 50 and a final expansion ratio of 150. Author

N78-10187# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ARTIFICIAL SATELLITE SEARCH STRATEGIES
Laurence G. Taff and John M. Soruai 7 Jul. 1977 33 p
(Contract F19628-76-C-0002; AF Proj. 2128)
(AD-A043574; ETS-16; ESD-TR-77-177) Avail: NTIS HC A02/MF A01 CSCL 15/3

Satellite search in four dimensions - right ascension, declination, magnitude, and parallax - is examined. The important sources of interference with search schemes are enumerated and their significance in relation to four specific search strategies is discussed. Author (GRA)

N78-10188# RAND Corp., Santa Monica, Calif.
GEOMETRIC PERFORMANCE OF PSEUDORANGING NAVIGATION SATELLITE SYSTEMS: A COMPUTER PROGRAM Interim Report
Jeannine V. Lamar, L. N. Rowell, and J. J. Mate Jul. 1977 101 p refs
(Contract F49620-77-C-0023)
(AD-A043744; R-1949-AF) Avail: NTIS HC A06/MF A01 CSCL 17/7

Describes a computer program designed to analyze many aspects of the geometric performance of pseudoranging navigation satellite (navsat) systems for users either on earth or in earth orbit. A navsat system includes a fleet of satellites, each with an accurate clock that transmits ephemeris, time, and other signals. These signal can be received by relatively small, inexpensive equipment, thus enabling the user to compute his position and time accurately. The NAVSTAR/Global Positioning System (GPS) is such a system, and its overall user accuracy can be broken down into two components which, when multiplied together, yield an estimate of the user's position and/or time accuracy. These two components are analyzed in this report; the first depends on the relative geometry among the navsats being employed and the user's location, and the second involves a determination of system errors. GRA

N78-10189# Army Communications Command, Fort Huachuca, Ariz.
PRODUCT ASSURANCE, OPERATIONAL QUALITY ASSURANCE, SATELLITE SYSTEMS TECHNICAL EVALUATION
31 May 1977 661 p refs
(AD-A043735; ACC-CCP-702-2) Avail: NTIS HC A99/MF A01 CSCL 17/2

This pamphlet contains the responsibilities and duties, and the administrative and logistical procedures governing the functions of a satellite test team. Calculation worksheets and tutorial information on test techniques and data analysis as well as equipment specifications and extracts of technical literature are included to aid in the assessment of a link and terminal. Test procedures for the radio system and pertinent audio series tests are furnished from which to determine the quality of customer service being provided. Author (GRA)

N78-10190# Army Electronics Command, Fort Monmouth, N. J.
SYNCHRONOUS METEOROLOGICAL SATELLITE DIRECT READOUT GROUND SYSTEM DIGITAL VIDEO ELECTRONICS
Marvin H. Dubbin and Dennis Hall Jun. 1977 31 p refs
(DA Proj. 1L1-62111-AH-71)
(AD-A043670; ECOM-5825) Avail: NTIS HC A03/MF A01 CSCL 22/2

The material presented in this report is a brief introduction to the Synchronous Meteorological Satellite (SMS) stretched Visual and Infrared Spin Scan Radiometer (VISSR) data down link. A brief description of the Direct Readout Ground Station (DRGS) follows. This is intended to give the reader a very general concept of the VISSR signal origin and user termination. Problem areas in the White Sands Missile Range DRGS are pointed out, and steps taken to correct the problems are briefly explained. The White Sands Digital Video Drawer is explained in great detail. Schematics are provided to help the reader through the explanation. The digital video drawer is the heart of the analog processing system and has presented the most problems. This report will be followed by additional reports and future updates and subsystem components. Author (GRA)

N78-10191# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DETECTIONS OF FAINT GEOSYNCHRONOUS SATELLITES AT THE GEODSS ETS FROM OCTOBER 1976 TO MARCH 1977
Eugene W. Rork 10 Jun. 1977 34 p refs
(Contract F19628-76-C-0002)
(AD-A043567; ETS-12; ESD-TR-77-119) Avail: NTIS HC A03/MF A01 CSCL 22/2

This report presents a record of faint geosynchronous satellites detected at the GEODSS ETS from October 1976 to March 1977. The satellites reported have at one time or another been difficult or impossible to detect electro-optically because solar reflections from them were faint. Author (GRA)

N78-10192# Old Dominion Systems, Inc., Gaithersburg, Md.
MODIFICATIONS TO FOTONAP Final Report
George E. Morduch Jul. 1977 40 p refs
(Contract DAAK70-77-F-0130)
(AD-A043607; ETL-0116) Avail: NTIS HC A03/MF A01 CSCL 08/5

The Fotonap program has been modified (1) to include the option to compute the desired solution without inverting the normal equations matrix (thus not obtaining the solution covariance matrix), and (2) to include the capability to handle Geoceiver measurements. For a typical run involving photogrammetric data, implementation of item (1) reduced the time taken to obtain the normal equations solution from 1 hour 50 minutes to 20 minutes. Two types of Geoceiver measurements have been modeled in Fotonap: satellite-to-ground and satellite-to-satellite. Each Geoceiver type may use either a fixed or a variable averaging time. Included in the implementation of the Geoceiver measurements is the Hopfield model for computing tropospheric refraction corrections. The above modifications have been implemented both on the UNIVAC 1108 and the CDC 6400 versions of Fotonap. Author (GRA)

N78-10193# California Univ., La Jolla. Inst. for Pure and Applied Physical Sciences.
PREPARE, CALIBRATE AND FLY A PROGRAMMABLE LOW-ENERGY PARTICLE DETECTION INSTRUMENT ON BOARD THE SCATHA SATELLITE Final Report, 1 Jan. 1976 - 31 Jul. 1977
Sherman E. DeForest 1 Sep. 1977 7 p
(Contract N00014-76-C-0432)
(AD-A044072) Avail: NTIS HC A02/MF A01 CSCL 18/4

This report summarizes the progress made on the preparation of the SC-9 plasma particle instrument for flight on the SCATHA space vehicle. The history of this project is long and complicated. Originally UCSD proposed to fly an ATS-5 flight spare instrument with suitable refurbishment and calibration. Then several agencies became involved with the problems of spacecraft charging. By the time the concept of SCATHA was established, the prototype instrument of the ATS-6 plasma instrument was available. This instrument is a vastly improved version of what had been flown on ATS-5. It detects particles over a much wider energy range and features sensing heads which rotate in two perpendicular directions. A major problem with either instrument is that they were built to interface to a specific spacecraft which had a considerably different configuration from SCATHA. This necessitated the construction of an interface box which not only prepares the telemetry signals, but does such things as accumulate the output signals (on ATS-6 accumulation and log compression were spacecraft functions). This in turn required the design and construction of a totally new ground support equipment. GRA

N78-10134*# Air Force Geophysics Lab., Hanscom AFB, Mass.
INJUN 5 OBSERVATIONS OF VEHICLE POTENTIAL FLUCTUATIONS AT 2500 km
R. C. Sagalyn and William J. Burke (Regis Coll. Research Center, Weston, Mass.) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 67-80 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10136*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ACTIVE CONTROL OF SPACECRAFT CHARGING ON ATS-5 AND ATS-6
Carolyn K. Purvis, Robert O. Bartlett (NASA. Goddard Space Flight Center), and Sherman E. DeForest (California Univ., La Jolla) *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 107-120 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10137*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ACTIVE CONTROL OF POTENTIAL OF THE GEOSYNCHRONOUS SATELLITES ATS-5 AND ATS-6
Raymond Goldstein *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 121-129 refs (For availability see N78-10129 01-12)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10138*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLASMA DISTRIBUTION AND SPACECRAFT CHARGING MODELING NEAR JUPITER
Raymond Goldstein and Neil Divine *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 131-141 refs (For availability see N78-10129 01-12)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10139*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
ACTIVE SPACECRAFT POTENTIAL CONTROL SYSTEM SELECTION FOR THE JUPITER ORBITER WITH PROBE MISSION
John R. Beattie and Raymond Goldstein *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 143-166 refs (For availability see N78-10129 01-12)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10141*# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ELECTRIFICATION OF THE PROOF MASS OF A DRAG-FREE OR ACCELEROMETRIC SATELLITE
Remy Juillert and Jean-Pierre Philippon (Centre d'Etudes et de Recherches de Toulouse, France) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 175-190 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10144*# California Univ., La Jolla.
MODELING OF SPACECRAFT CHARGING
Elden C. Whipple, Jr. *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 225-235 refs (For availability see N78-10129 01-12)
(Grant NGL-05-005-007; Contract F19628-76-C-0214)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10145*# General Electric Co., Philadelphia, Pa. Space Div.
A CHARGING MODEL FOR THREE-AXIS STABILIZED SPACECRAFT
M. J. Massaro, T. Green, and D. Ling *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 237-269 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10147*# Rockwell International Corp., Downey, Calif. Space Div.
AN ALTITUDE-DEPENDENT SPACECRAFT CHARGING MODEL
J. W. Haffner *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 287-296 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10148*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
PIONEER VENUS SPACECRAFT CHARGING MODEL
P. A. Robinson, Jr. and A. B. Holman *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 297-308 refs (For availability see N78-10129 01-12)
(Contract NAS2-8300)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10150*# Systems Science and Software, La Jolla, Calif. Plasma Physics Group.
DYNAMIC MODELING OF SPACECRAFT IN A COLLISIONLESS PLASMA
Ira Katz, Donald E. Parks, Sang Wang, and Andrew Wilson *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 319-330 refs (For availability see N78-10129 01-12)
(Contracts NAS3-20119; DNA001-76-C-0121)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10151*# Parker (Lee W.), Inc., Concord, Mass.
CALCULATION OF SHEATH AND WAKE STRUCTURE ABOUT A PILLBOX-SHAPED SPACECRAFT IN A FLOWING PLASMA
Lee W. Parker *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 331-366 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10153*# Air Force Geophysics Lab., Hanscom AFB, Mass.
A SIMULATION MODEL OF TIME-DEPENDENT PLASMA-SPACECRAFT INTERACTIONS
P. L. Rothwell, A. G. Rubin, and G. K. Yates *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 389-411 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10154*# Lunar Science Inst., Houston, Tex.
PHOTOELECTRIC CHARGING OF PARTIALLY SUNLIT DIELECTRIC SURFACES IN SPACE
Bibhas R. De and David R. Criswell *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 413-421 refs (For availability see N78-10129 01-12)
(Contract NSR-09-051-001)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10171*# Aerospace Corp., El Segundo, Calif.
SYSTEM ASPECTS OF SPACECRAFT CHARGING
S. P. Bower *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 719-721 (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10172*# Stanford Research Inst., Menlo Park, Calif. Electromagnetic Sciences Lab.
TRANSIENT RESPONSE MEASUREMENTS ON A SATELLITE SYSTEM
J. E. Nanevicz and R. C. Adamo *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 723-734 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10174*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEVELOPMENT OF ENVIRONMENTAL CHARGING EFFECT MONITORS FOR OPERATIONAL SATELLITES
N. John Stevens, John C. Sturman, and Frank D. Berkopec *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 745-751 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10175*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VIKING AND STP P78-2 ELECTROSTATIC CHARGING DESIGNS AND TESTING
R. O. Lewis, Jr. *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 753-772 Lakewood, Colo. (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10176*# Communications Research Centre, Ottawa (Ontario). Dept. of Communications.
DESIGN, CONSTRUCTION AND TESTING OF THE COMMUNICATIONS TECHNOLOGY SATELLITE PROTECTION AGAINST SPACECRAFT CHARGING
J. Victor Gore *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 773-788 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10177*# General Electric Co., Philadelphia, Pa.
COMMON APPROACH TO SOLVING SGEMP, DEMP, AND ESD SURVIVABILITY
D. Ling *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 789-803 (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10180*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
SPACECRAFT CHARGING ANOMALIES ON THE DSCS II, LAUNCH 2 SATELLITES
George T. Inouye *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 829-852 refs (For availability see N78-10129 01-12)
(Contract F04701-69-C-0091)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10181*# Royal Aircraft Establishment, Farnborough (England).
SPACE ENVIRONMENTAL EFFECTS ON THE SKYNET 2B SPACECRAFT
A. Robbins and C. D. Short *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 853-863 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10182*# RCA American Communications, Inc., Piscataway, N. J.
RCA SATCOM 3-AXIS SPACECRAFT EXPERIENCE AT GEOSYNCHRONOUS ALTITUDE
Joseph Napoli and Joseph Seliga (RCA Astro-Electronics Div.) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 865-871 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N78-10194*# New Mexico State Univ., Las Cruces. Physical Science Lab.
ANTENNA EVALUATION STUDY FOR THE SHUTTLE MULTISPECTRAL RADAR, PHASE 2 Final Report
Edgar L. Coffey, III and Keith R. Carver May 1977 68 p
(Contract NAS9-95471)
(NASA-CR-151538; PA00881) Avail: NTIS HC A04/MF A01 CSCL 17B

The results of the second phase of the Antenna Evaluation Study for the Shuttle Imaging Radar are presented. The objectives of Phase II were (1) to complete the specifications for the subarray test panels, (2) to begin a study of the effects of electrical and mechanical tolerance variations on overall SIRA performance, (3) to initiate the development of a mathematical model which adequately described the array performance and (4) to begin the development of a comprehensive computer program which will eventually simulate the performance characteristics of the antenna in a spaceborne environment. Items (2), (3), and (4) were begun in Phase I (ahead of schedule), and because of this, it has been possible to accelerate the Phase II modeling/simulation objectives to the point where simulations of expected mechanical/electrical errors have already been produced. Author

N78-10195*# Axiomatix, Marina del Rey, Calif.
INVESTIGATION AND EVALUATION OF SHUTTLE/GPS NAVIGATION SYSTEM Final Report
Peter W. Nilsen 15 Oct. 1977 202 p refs
(Contract NAS9-15387)
(NASA-CR-151539; R7710-3) Avail: NTIS HC A10/MF A01 CSCL 17G

Iterative procedures were used to analyze the performance of two preliminary shuttle/GPS navigation system configurations: an early OFT experimental system and a more sophisticated system which consolidates several separate navigation functions thus permitting net cost savings from decreased shuttle avionics weight and power consumption, and from reduced ground data processing. The GPS system can provide on-orbit navigation accuracy an order of magnitude better than the baseline system, with very adequate link margins. The worst-case link margin is 4.3 dB. This link margin accounts for shuttle RF circuit losses which were minimized under the constraints of program schedule and environmental limitations. Implicit in the link analyses are the location trade-offs for preamplifiers and antennas. Author

N78-10196*# Martin Marietta Corp., Baltimore, Md.
LIFE SCIENCES SPACELAB MISSION DEVELOPMENT TEST 3 (SMD 3) DATA MANAGEMENT REPORT
E. C. Moseley 30 Sep. 1977 64 p refs
(Contract NAS9-14507)
(NASA-CR-151540; SD-SMD-3-004; JSC-13141) Avail: NTIS HC A04/MF A01 CSCL 22B

Development of a permanent data system for SMD tests was studied that would simulate all elements of the shuttle onboard, telemetry, and ground data systems that are involved with spacelab operations. The onboard data system (ODS) and the ground data system (GDS) were utilized. The air-to-ground link was simulated by a hardwired computer-to-computer interface. A patch board system was used on board to select experiment inputs, and the downlink configuration from the ODS was changed by a crew keyboard entry to support each experiment. The ODS provided a CRT display of experiment parameters to enable the crew to monitor experiment performance. An onboard analog system, with recording capability, was installed to handle high rate data and to provide a backup to the digital system. The GDS accomplished engineering unit conversion and limit sensing, and provided realtime parameter display on CRT's in the science monitoring area and the test control area. Author

N78-10197*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACELAB BASELINE ECS TRACE CONTAMINANT REMOVAL TEST PROGRAM
C. D. Ray and J. B. Stanley Sep. 1977 38 p refs
(NASA-TM-78135) Avail: NTIS HC A03/MF A01 CSCL 22B

An estimate of the Spacelab Baseline Environmental Control System's contaminated removal capability was required to allow determination of the need for a supplemental trace contaminant removal system. Results from a test program to determine this removal capability are presented. Author

N78-10198*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex. Astronautics Div.
SAIL GTS GROUND SYSTEM ANALYSIS: AVIONICS SYSTEM ENGINEERING
R. M. Lawton 7 Oct. 1977 9 p ref
(Contract NAS9-14960)
(NASA-CR-151543; DN-1.3-C0804-040) Avail: NTIS HC A02/MF A01 CSCL 17B

A comparison of two different concepts for the guidance, navigation and control test set signal ground system is presented. The first is a concept utilizing a ground plate to which crew station, avionics racks, electrical power distribution system, master electrical common connection assembly and marshall mated elements system grounds are connected by 4/0 welding cable. An alternate approach has an aluminum sheet interconnecting the signal ground reference points between the crew station and avionics racks. The comparison analysis quantifies the differences between the two concepts in terms of dc resistance,

ac resistance and inductive reactance. These parameters are figures of merit for ground system conductors in that the system with the lowest impedance is the most effective in minimizing noise voltage. Although the welding cable system is probably adequate, the aluminum sheet system provides a higher probability of a successful system design. Author

N78-10199*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE ORBITER APPROACH AND LANDING TEST EVALUATION REPORT. CAPTIVE-ACTIVE FLIGHT TEST SUMMARY
Sep. 1977 112 p refs
(NASA-TM-75011; JSC-13045) Avail: NTIS HC A06/MF A01 CSCL 22A

Captive-active tests consisted of three mated carrier aircraft/Orbiter flights with an active manned Orbiter. The objectives of this series of flights were to (1) verify the separation profile, (2) verify the integrated structure, aerodynamics, and flight control system, (3) verify Orbiter integrated system operations, and (4) refine and finalize carrier aircraft, Orbiter crew, and ground procedures in preparation for free flight tests. A summary description of the flights is presented with assessments of flight test requirements, and of the performance operations, and of significant flight anomalies is included. Author

N78-10135*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY REPORT ON THE CTS TRANSIENT EVENT COUNTER PERFORMANCE THROUGH THE 1976 SPRING ECLIPSE SEASON
N. John Stevens, Robert R. Lovell, and Vernon W. Klinect *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 81-105 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22A

N78-10146*# Battelle Pacific Northwest Labs., Richland, Wash.
INDUCED CHARGING OF SHUTTLE ORBITER BY HIGH ELECTRON-BEAM CURRENTS
H. B. Liemohn *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 271-286 refs (For availability see N78-10129 01-12)
(Contract NAS8-31415)
Avail: NTIS HC A99/MF A01 CSCL 22B

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N78-10200*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELAUNCH TESTING OF THE LASER GEODYNAMIC SATELLITE (LAGEOS)
M. W. Fitzmaurice, P. O. Minott, J. B. Abshire, and H. E. Rowe 1977 100 p refs
(NASA-TP-1062; G-7702-F-16) Avail: NTIS HC A05/MF A01 CSCL 22A

The LAGEOS was extensively tested optically prior to launch. The measurement techniques used are described and resulting data is presented. Principal emphasis was placed on pulse spreading characteristics, range correction for center of mass tracking, and pulse distortion due to coherent effects. A mode-locked freqeuncy doubled Nd:YAG laser with a pulse width of about 60 ps was used as the ranging transmitter and a crossfield photo-multiplier was used in the receiver. High speed sampling electronics were employed to increase receiver bandwidth. LAGEOS reflected pulses typically had a width of 250 ps with a variability in the range correction of less than 2 mm rms. Pulse distortion due to coherent effects was inferred from average waveforms and appears to introduce less than + or - 50 ps jitter in the location of the pulse peak. Analytic results on this effect based on computer simulations are also presented. Theoretical and experimental data on the lidar cross section were developed in order to predict the strength of lidar echoes from the satellite. Cross section was measured using a large aperture laser collimating system to illuminate the LAGEOS. Reflected radiation far-field patterns were measured using the collimator in an autocollimating mode. Data were collected with an optical data digitzer and displayed as a three-dimensional plot of intensity versus the two far-field coordinates. Measurements were made at several wavelengths, for several types of polarizations, and as a function of satellite orientation. Author

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N78-10201 South Carolina Univ., Columbia.
COMPLEX SPACECRAFT COMPARTMENT VENTING SYSTEMS Ph.D. Thesis
George William Ivey, Jr. 1976 142 p
Avail: Univ. Microfilms Order No. 77-13904

An area predictor method for solving the venting system design problem is presented. This method initially approximates the minimum flow areas for the vent components at the design conditions. The predictor method is based on the maximum pressure differentials allowed across the compartment walls, the maximum rate of change of pressure allowed within each compartment, the external time varying pressure, the external pressure decay rate, and the governing differential equations for isentropic compartment and vent flow processes. This method substantially reduces the number of iterations required in developing a system. A method for determining the flow characteristic of unique vent components from one to approximately zero atmospheres is also given. Analytical predictions for an actual venting system are compared with both ground and flight venting data. Dissert. Abstr.

N78-10202# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
SPACECRAFT CONTAMINATION UNDER SIMULATED ORBITAL ENVIRONMENT Interim Report
Roger W. Phillips, Lucio U. Tolentino, and Seymour Feuerstein 6 Jul. 1977 46 p refs
(Contract F04701-76-C-0077)
(AD-A042433; TR-0077(2270-30)-2; SAMSO-TR-77-130)
Avail: NTIS HC A03/MF A01 CSCL 22/2

Volatile condensable material (VCM) measurements on a number of spacecraft materials have indicated that contamination rates onto surfaces at subambient temperatures cannot be predicted from standard outgassing tests, particularly where long-term exposures are involved. Contamination rates may depend markedly on temperature differentials between source and collector, the collection temperature, the source geometry and the exposure time. Contamination rates may also be influenced by solar irradiation. The results of this study were obtained on a new VCM facility that overcomes many deficiencies experienced in earlier designs and permits accurate simulation of space environmental conditions. Advantages of the present system include an oil-free, high-vacuum chamber (1 to 10 nanotorr) source temperatures from ambient to 125 C, collection temperatures from -140 to +125 C, total mass-loss measurements, in-situ VCM mass measurements with use of an internal-temperature-compensated quartz-crystal microbalance, in-situ vacuum ultraviolet irradiation of either the specimen or of the collected VCM, and infrared identification of the VCM by

multiple internal reflection spectroscopy. The system also features automated data acquisition and data processing. GRA

N78-10203# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
QUALIFICATION OF MATERIALS AND MATERIALS LISTS APPLICABLE TO SPACE PROJECTS
Paris ESA 1 Sep. 1975 21 p
(ESA-PSS-19/QRM-16-Issue-2) Avail: NTIS HC A02/MF A01

The documentation system to be applied to materials during the initial phases of any space project is specified. The documentation considered consists of (a) preferred materials lists and (b) declared materials lists. Only those mentioned under (b) are a requirement imposed by ESA on its contractors. Preferred materials lists, which contractors should establish to facilitate adherence to this requirement, are also dealt with. An interpretation of the term 'qualification' is given. Author (ESA)

N78-10130*# Air Force Geophysics Lab., Hanscom AFB, Mass.
PROCEEDINGS OF THE SPACECRAFT CHARGING TECHNOLOGY CONFERENCE: EXECUTIVE SUMMARY
C. P. Pike, E. C. Whipple, Jr. (Calif. Univ., La Jolla), N. J. Stevens (NASA. Lewis Res. Center), M. L. Minges (AFML), W. L. Lehn (AFML), and M. H. Bunn (SAMSO) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 9-20 (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10156*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TESTING OF TYPICAL SPACECRAFT MATERIALS IN A SIMULATED SUBSTORM ENVIRONMENT
N. John Stevens, Frank D. Berkopec, John V. Staskus, Richard A. Blech, and Steven J. Narciso *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 431-457 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 11G

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N78-10204 Georgia Inst. of Tech., Atlanta.
INVESTIGATION OF CHEMICALLY REACTING BOUNDARY LAYERS IN SOLID PROPELLANT ROCKETS: STEADY AND PERIODIC SOLUTIONS Ph.D. Thesis
Rajeev Srivastava 1977 172 p
Avail: Univ. Microfilms Order No. 77-14257

The problem of the unsteady combustion response of a burning solid propellant subjected to longitudinal acoustic oscillations in pressure and velocity was investigated using a steady state theory which takes into account the erosive burning of the propellant under conditions of laminar flow. Parametric differentiation was used to solve the conservation equations characterizing the boundary layer flow over the surface of a pyrolysing homogeneous solid propellant. Solutions for the perturbations in the solid and gas phases when isentrophic standing waves of pressure and velocity are superposed on the steady flow outside the boundary layer are obtained and coupled to yield the pressure-velocity coupled response function to describe modifications in the steady state mass burning rate of the propellant. The contribution of the burning propellant towards the growth or decay of acoustic waves in the combustor is appropriately described by the response function at the edge of the boundary layer. Dissert. Abstr.

N78-10205*# Hughes Research Labs., Malibu, Calif. Ion Physics Dept.
EXTENDED PERFORMANCE SOLAR ELECTRIC PROPULSION THRUST SYSTEM STUDY. VOLUME 1: EXECUTIVE SUMMARY Final Report
R. L. Poeschel and E. I. Hawthorne Sep. 1977 106 p refs
(Contract NAS3-20395)
(NASA-CR-135281) Avail: NTIS HC A06/MF A01 CSCL 21C

Several thrust system design concepts were evaluated and compared using the specifications of the most advanced 30 cm engineering model thruster as the technology base. The extensions in thruster performance required for the Halley's comet mission were defined and alternative thrust system concepts were designed. Confirmation testing and analysis of thruster and power-processing components were performed, and the feasibility of satisfying extended performance requirements was verified. A baseline design was selected from the alternatives considered, and the design analysis and documentation were refined. A program development plan was formulated that outlines the work structure considered necessary for developing, qualifying, and fabricating the flight hardware for the baseline thrust system within the time frame of a project to rendezvous with Halley's comet. An assessment was made of the costs and risks associated with a baseline thrust system as provided to the mission project under this plan. Critical procurements and interfaces were identified and defined. Results are presented. Author

N78-10206*# Rocketdyne, Canoga Park, Calif.
TRIPROPELLANT ENGINE STUDY
D. B. Wheeler 9 Oct. 1977 34 p refs
(Contract NAS8-32613)
(NASA-CR-150444; ASR-77-213; BMPR-1) Avail: NTIS HC A03/MF A01 CSCL 21H

Work conducted was devoted to three main tasks. Thermochemical equilibrium performance data were assembled to establish the expected performance calculations of the mode 1 engine propellant combinations and thermodynamic and transport data for the products of combustion. Turbine drive gas characteristics were also established. Thrust chamber and nozzle cooling studies were devoted to the evaluation of H2, C3H8, CH4, and RP-1 as coolants in the existing SSME cooling circuit geometry. It was found that all these candidate coolants are feasible without limiting the desired operating conditions with the exception of RP-1, which would limit the maximum P(c) to 2000 psia. RP-1 could be used, however, to cool the nozzle only without imposing the chamber pressure limit. A total of 15 candidate engine system cycles were selected and a preliminary engine system balance was conducted for 12 of these systems to establish component operating flowrates, pressures and temperatures. It was found that the staged combustion cycles employing fuel rich LOX/hydrocarbon turbine drive gases are power limited. Author

N78-10207# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
HYDROTEST FOR FLTSATCOM Final Report, Nov. 1976 - Apr. 1977
Richard H. Brown Aug. 1977 64 p
(AD-A043577; AFRPL-TR-77-30) Avail: NTIS HC A04/MF A01 CSCL 21/8

On 7 April 1977 AFRPL conducted a hydrostatic burst test of a fired TE-M-364-19 motor case. During testing the case was constrained such that firing conditions were simulated. This test-to-failure demonstrated that the case had a safety factor in excess of the 1.25 minimum. Author (GRA)

N78-10208# Fairchild Republic Co., Farmingdale, N. Y.
PULSED PLASMA PROPULSION TECHNOLOGY

Final Report, 10 Mar. 1972 - 30 May 1977
Dominic J. Palumbo and William J. Guman Sep. 1977 43 p refs
(Contract F04611-72-C-0053)
(AD-A043529; MS147R300; AFRPL-TR-77-40) Avail: NTIS HC A03/MF A01 CSCL 17/9

A pulsed plasma thruster system delivering one millipound of thrust at a sustained firing rate of .16 Hz and specific impulse of 1620 seconds was developed, designed, fabricated, and tested for a total of 12,183 pound-seconds (55, 714 Newton-seconds) of total impulse prior to voluntary shut-down of the test. The system utilizes high energy density 40 Joules/pound (81.7J/kg) KF-film capacitors and a completely packaged bread-board power converter. A total impulse capability of 37,500 pounds-seconds (166, 810 Newton-seconds) was designed into the system and the resulting 23.44 pounds (10.63 kg) of solid Teflon propellant is stored in the shape of a helical coil having an outside diameter of 17.32 inches (44 cm) and overall height of 6.25 inches (15.88 cm). The system was refurbished after completion of the endurance test so that the total compliment of propellant could be restored and run to complete depletion at the AFRPL during their in-house endurance test. This report describes in detail the system and results of endurance testing at Fairchild Republic Company. Author (GRA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N78-10209 Brown Univ., Providence, R. I.
AN INVESTIGATION OF ELEVATED TEMPERATURE CREEP IN POLYMERS AND IN 304 STAINLESS STEEL Ph.D. Thesis
Roger Mark 1976 100 p
Avail: Univ. Microfilms Order No. 77-14164

Creep properties at elevated temperatures are described for amine-cured epoxy resins, a low density polyethylene, and type 304 stainless steel. Isothermal time-dependent changes in thermal expansion following an abrupt change in temperature were observed in epoxy resins with different degrees of crosslinking. Decreases in tensile creep behavior with decreased expansion were observed. Creep under a given shear stress at different constant temperatures was found to be adequately described by time-temperature superposition for low density polyethylene. The multiple integral representation was found to be a satisfactory model of constant-stress combined tension-torsion creep in 304 stainless steel at 1100 F. Creep surfaces are defined as surfaces with constant creep rates and normal strain rate vectors. For combined tension-torsion stress states the creep surface in 304 stainless steel were found to be closely approximated by the Mises yield surface. Dissert. Abstr.

N78-10210# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
THE GENERATION OF GEM-DIFLUOROALLYLLITHIUM BY THE TRANSMETALATION REACTION
Dietmar Seyferth and Karl R. Wursthorn 28 Jul. 1977 9 p refs Submitted for publication
(Contract N00014-76-C-0837)
(AD-A042885) Avail: NTIS HC A02/MF A01 CSCL 07/3

3-3-Difluoroallyltrimethyltin was prepared by reaction of chlorodifluoromethane with the ylide reagent Ph3P=CHCH2SnMe3. gem-Difluoroallyllithium, which was generated by the reaction of n-butyllithium with 3-3-difluoroallyltrimethyltin in THF at -95, was of very limited stability at that temperature. However, in situ procedures and alternate incremental addition procedures allowed its application in the synthesis of 1-1-difluoroallylsilanes from chlorosilanes and of CH2-CHCF2C(OH)Et2 from 3-pentanone. Author (GRA)

N78-10211# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
A GENERAL ROUTE TO TERMINALLY SUBSTITUTED ALLYLIC DERIVATIVES OF SILICON AND TIN. PREPARATION OF ALLYLIC LITHIUM REAGENTS
Dietmar Seyferth and Karl R. Wursthorn 1 Jun. 1977 15 p refs Submitted for publication
(Contract N00014-76-C-0837)
(AD-A042884) Avail: NTIS HC A02/MF A01 CSCL 07/2

It is obvious that this new route to allylic compounds of silicon and tin should be quite general in its scope of applicability. By appropriate variation of the phosphorus ylide and the carbonyl substrate in these reactions, allylic derivatives of silicon and tin of type Me3MCH2C(R)=CR'R', where R, R' and R' should be capable of wide variation, should be accessible. The allyltins thus prepared would provide starting materials for many new allylic lithium reagents. In many cases the direct lithiation procedure, the reaction of RLi/Lewis base or RLi/Me3OK with an appropriate unsaturated hydrocarbon, would provide the simplest route to the desired allylic lithium reagent. However, the additives which usually are required to effect such metalations may not always be compatible with other functionality in the carbonyl reactant or may interfere in other ways. Also, there will be instances when the appropriate unsaturated hydrocarbon is not available. Thus the versatility of our new procedure and its ease of application may prove very useful in organic and organometallic synthesis. GRA

N78-10212# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
ESR EVIDENCE FOR THE SYNTHESES OF NF(3 PLUS) RADICAL CATION AS AN INTERMEDIATE IN THE SYNTHESES OF NF(4 PLUS) SALTS BY LOW TEMPERATURE UV-PHOTOLYSIS Technical Report, 1 Feb. - 30 Jun. 1977
Karl O. Christie and Ira B. Goldberg 10 Jun. 1977 14 p refs Submitted for publication
(Contract N00014-73-C-0325; NR Proj. 051-553)
(AD-A042911; SC549.23TR) Avail: NTIS HC A02/MF A01 CSCL 07/2

The NF3(+) radical cation was detected in large concentrations by UV photolysis of mixtures of NF3, F2 and BF3, and NF3, F2, and AsF6. No signal was detected in the absence of NF3. The results suggest that the NF3(+) radical cation is an important intermediate in the formation of NF4(+) salts; the initial step in UV activation of F2; Chain reaction mechanisms do not contribute significantly to the reaction. Author (GRA)

N78-10213*# National Bureau of Standards, Washington, D. C. Inst. for Materials Research.
WORKSHOP ON APPLICATIONS OF PHASE DIAGRAMS IN METALLURGY AND CERAMICS Final Summary Report
L. H. Bennett and G. C. Carter Apr. 1977 234 p Workshop held at Gaithersburg, Md., 10-12 Jan. 1977 Sponsored in part by NASA, NSF, ONR, Army Office and ERDA
(NASA-CR-155196; PB-269281/2; NBSIR-77-1239) Avail: NTIS HC A11/MF A01 CSCL 11B

A workshop was held to assess the current national and international status of phase diagram determinations and evaluations for alloys, ceramics, and semiconductors; to determine the needs and priorities, especially technological, for phase diagram determinations and evaluations; and to estimate the resources being used and potentially available for phase diagram evaluation. Highlights of the workshop, description of a new poster board design used in the poster sessions, lists of attendees and demonstrations, the program, and descriptions of the presentations are included. GRA

N78-10163*# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
CONDUCTIVE SPACECRAFT MATERIALS DEVELOPMENT PROGRAM
William L. Lehn *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 559-567 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 11G

24 COMPOSITE MATERIALS

Includes laminates.

N78-10214* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
COMPOSITE SANDWICH LATTICE STRUCTURE Patent
Marvin D. Rhodes, inventor (to NASA) and Martin M. Mikulas, Jr. Issued 4 Oct. 1977 13 p Filed 14 Sep. 1976 Supersedes N77-15103 (15 - 06, p 0715)
(NASA-Case-LAR-11898-1; US-Patent-4,052,523; Appl-SN-723264; US-Patent-Class-428-116; US-Patent-Class-428-73; US-Patent-Class-428-138; US-Patent-Class-428-902) Avail: US Patent Office CSCL 11D

A lattice type structural panel is described. The panel utilizes the unidirectional character of filamentary epoxy impregnated composites. The panels are stiff lightweight structures for use in constructing space satellites and the like.
Official Gazette of the U.S. Patent Office

N78-10215 Illinois Univ., Urbana-Champaign.
THE EFFECTS OF MELT COMPOSITION ON THE CRYSTALLIZATION BEHAVIOR OF SODIUM AND BARIUM OCTABORATE Ph.D. Thesis
Charles John Leedecke 1977 209 p
Avail: Univ. Microfilms Order No. 77-14977

The temperature dependence of the crystal growth rates of NA2B8O13 and BAB8O13 in selected melts was determined. The maximum growth rates occurred in the stoichiometric melts. The reduction in growth rates in the nonstoichiometric melts is explained by considering the rejection and transport of the noncrystallizable species at the melt-crystal interface. The stability of the advancing interfaces is explained in terms of a layer-spreading mechanism coupled with surface diffusion. The temperature dependence of the molar volume was determined for various binary sodium borate and barium borate compositions. The electrical conductivity of the binary borate compositions was measured above and below the glass transformation temperature. the viscosity of these melts was also measured and the results were analyzed in terms of the free volume theory. Dissert. Abstr.

N78-10216*# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
EXPERIMENTAL EVALUATION OF THE TENSOR POLYNOMIAL CRITERION FOR DESIGNING COMPOSITE STRUCTURES Final Report
R. C. Tennyson Oct. 1977 98 p refs
(Grant NsG-7219)
(NASA-CR-155219) Avail: NTIS HC A05/MF A01 CSCL 11D

A comprehensive experimental and analytical evaluation of the tensor polynomial failure criterion was undertaken to determine its capability for predicting the ultimate strength of a composite limina subject to a plane stress state. Results are presented demonstrating that a quadratic formulation is too conservative and a cubic representation is required. Strength comparisons with test data derived from glass/epoxy and graphite/epoxy tubular specimens are also provided to validate the cubic strength criterion. Environmental effects including ambient temperature, exposure to vacuum, length of post-cure time, and rate of cool down were also investigated. Behavior changes associated with polymer (epoxy) matrix composites were determined in terms of variations in stiffness and tensile strength. Author

N78-10217*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONSOLIDATION OF SILICON NITRIDE WITHOUT ADDITIVES
Paul F. Sikora and Hun C. Yeh 1977 13 p refs Presented at Fall Meeting of the Am. Ceramic Soc., San Francisco, 31 Oct. - 3 Nov. 1976
(NASA-TM-73693; E-9229) Avail: NTIS HC A02/MF A01 CSCL 11D

The feasibility of producing a sound, dense Si3N4 body without additives was explored, using conventional gas hot isostatic pressing techniques and an uncommon hydraulic hot isostatic pressing technique. These two techniques produce much higher pressure 275-413 MN/m sq (40,000 - 60,000 psi) than hot-pressing techniques. Evaluation was based on density measurement, microscopic examination, both optical and electron, and X-ray diffraction analysis. The results are summarized as follows: (1) Si3N4 can be densified to high density, greater than 95% of theoretical, without additions. (2) The higher density Si3N4 specimens appear to be associated with a greater amount of alpha to beta transformation. (3) Under high pressure, the alpha to beta transformation can occur at a temperature as low as 1150 C. (4) Grain deformation and subsequent recrystallization and grain refinement result from hot isostatic pressing of Si3N4. Author

N78-10218# Forest Products Lab., Madison, Wis.
RESIN SYSTEMS AND GLASS REINFORCEMENTS TO IMPROVE DRY-FORMED HARDBOARDS
P. E. Steinmetz 1977 14 p refs
(AD-A042026; FSRP-FPL-284) Avail: NTIS HC A02/MF A01 CSCL 11/4

Various resin systems and quantities of resin and a glass yarn scrim were investigated to determine whether they improved stiffness and linear stability of dry-formed, medium-and high-density hardboards. The following resins were used: A low-viscosity (penetrating) and a medium-viscosity (typical bonding type) phenolic, separately, in combination, or viscosity-modified; a two-part epoxy resin; and a powdered thermoplastic resin either separately or in combination with the low-viscosity phenolic. Increasing the quantity of phenolic resin improved both wet-formed and dry-formed board properties but at a diminishing rate with the increase. The low-viscosity phenolic or a combination of the low-and the medium-viscosity phenolic resulted in the best boards. The powdered thermoplastic resin in combination with the low-viscosity phenolic resin provided boards with good wet and dry properties. If analyzed on a total cost basis, this combination of resins has potential as a substitute for phenolic resin. The epoxy system was difficult to handle because of its high viscosity and the tackiness of the fiber after resin was applied. Board strengths were low. The glass yarn scrim pretreated with phenolic resin and bonded to each side of the hardboard mat was highly effective, especially in reducing board linear movement with changes in moisture. Author (GRA)

N78-10219# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
STRUCTURAL DEGRADATION IN FIBER COMPOSITES BY KINKING Technical Report, 1 May 1976 - 30 Apr. 1977
A. G. Evans and W. F. Adler 1 May 1977 63 p refs
(Contract N00014-76-C-0854)
(AD-A042528; SC5076.3TR) Avail: NTIS HC A04/MF A01 CSCL 11/4

Some observations of kinking in carbon composites, which identify the modes and morphology of kinking in fibrous materials, are presented. The thermodynamics and mechanics of kinking are analyzed. The analyses indicate the important role of matrix deformation (plastic and elastic) in determining the kink morphology, and identify the matrix yield strength and the distribution of fiber fracture strengths as the primary properties governing kink formation. Author (GRA)

N78-10220# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio. Structural Concepts Branch.
LOAD SPECTRUM EFFECTS ON BONDED COMPOSITE JOINTS Final Report, Jan. 1972 - Dec. 1976
R. T. Achard and M. D. Richardson Apr. 1977 105 p refs
(AD-A042435; AFFDL-TR-77-29) Avail: NTIS HC A06/MF A01 CSCL 13/5

This report presents the results of an experimental study of the fatigue and residual strength behavior of double lap boron/epoxy-to-titanium bonded joints. The program investigated various effects of load spectrum truncation, frequency, and intensity, and surface ply orientation on specimen endurance at a room temperature, dry environment. Results indicate the sensitivity of fatigue life to the orientation of the plies at the bond surface. Low amplitude loads, approximately lg about the mean, were significant and should not be arbitrarily truncated. Proof loading to 130% of limit load significantly reduced fatigue life even where spectrum loads were of this same magnitude. Fully random load sequencing was found to reduce the endurance or flight-by-flight missions to failure over a contrived but reasonably random spectrum that contained blocked loading (constant amplitude) of low intensity loads. The location of the scrim material on each boron/epoxy ply played a significant role in the strength

and failure mode of the joints. The frequency of applying loads was not significant, comparing 1/2 Hz and 8 Hz endurance data. Author (GRA)

N78-10221# Cornell Univ., Ithaca, N. Y. Sibley School of Mechanical and Aerospace Engineering.
PROBABILISTIC MODELS OF THE STRESS-RUPTURE OF COMPOSITE MATERIALS Progress Report, 15 Jun. 1976 - 14 Jun. 1977
S. L. Phoenix Mar. 1977 51 p refs
(Contract EY-76-S-02-4027)
(COO-4027-1) Avail: NTIS HC A04/MF A01

The development of time-dependent models for the random strength and stress-rupture of unidirectional composites was pursued. Emphasis was placed on modeling accurately the lower-tail behavior of the probability distributions of failure. An assumption of previous models was retained, namely that of considering the composite as a chain of sections or bundles each having length delta, the so-called ineffective length. Also, matrix-influenced load concentration factors were generated for unbroken fibers neighboring one or more adjacent failed fibers. The point of departure from previous studies was to obtain exactly the probability distribution of section strength concentrating on numerical accuracy in the lower tail. The case of five bibers was solved exactly, and combinatorial and straightforward computational techniques are being developed to handle cases of much higher order on the computer. Plotted results indicate that the matrix influence on lower-tail behavior is severe enough to alter failure predictions for long composite specimens. ERA

N78-10222# Oak Ridge National Lab., Tenn.
SOLDERING OF COPPER-CLAD NIOBIUM-TITANIUM
A. J. Moorhead, J. J. Woodhouse, and D. S. Easton Apr. 1977 22 p refs
(Contract W-7405-eng-26)
(ORNL/TM-5774) Avail: NTIS HC A02/MF A01

Although many techniques are being considered for joining composite superconductors, soldering is the most common. The wetting and flow behavior of various solder and flux combinations on a copper-clad Nb-Ti composite was determined, equipment and techniques for soldering and inspection of lap joints were developed, and the shear strength of joints at temperatures down to -269 C (4 K) were determined. Fifteen solders and seventeen commercial and experimental fluxes in the wettability and flow tests were studied. A resistance unit was built for soldering test specimens. A series of samples soldered with 80 Pb-20 Sn, 83 Pb-15 Sn-2 Sb, 97.5 Pb-1.5 Ag-1 Sn, 80 In-15 Pb-5 Ag, or 25 In-37.5 Sn (wt percent) was inspected by three nondestructive techniques. Through-transmission ultrasound gave the best correlation with nonbond areas revealed in peel tests. Single-lap shear specimens soldered with 97.5 Pb-1.5 Ag-1 Sn had the highest strength (10.44 ksi, 72 MPa) and total elongation (0.074 in., 1.88 mm) at -269 C (4 K) of four solders tested. ERA

N78-10223# European Space Research and Technology Center, Noordwijk (Netherlands). Quality and Reliability Div.
PHENOLIC RESIN BASED MATERIALS PROCEDURE FOR CLEANING AND IMPREGNATION WITH OIL
Paris ESRO Jul. 1974 7 p In FRENCH; ENGLISH summary
(ESRO-PSS-17/QRM-12P-Issue-1) Avail: NTIS HC A02/MF A01

A procedure by which phenolic-resin based materials can be first cleaned and then impregnated with oil is described. The procedure is intended for use with materials used in the manufacture of ball-bearing cages and its aim is to eliminate impurities and increase porosity. Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N78-10224* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUEL COMBUSTOR Patent
Cecil J. Marek, inventor (to NASA) Issued 4 Oct. 1977 5 p Filed 31 Mar. 1976 Supersedes N76-20215 (14 - 11, p 1358)
(NASA-Case-LEW-12137-1; US-Patent-4,052,144; US-Patent-Appl-SN-672210; US-Patent-Class-431-352; US-Patent-Class-431-158; US-Patent-Class-60-39.51R; US-Patent-165-105) Avail: US Patent Office CSCL 21B

A fuel combustor comprises a chamber with air and fuel inlets and a combination gas outlet. The fuel is supplied to a vaporization zone and fuel and air are mixed in a pair of mixing chambers, each exemplified by a swirl can. The resultant mixture is directed into a combustion zone within the combustor. Heat pipes are arranged with one end portion substantially in the combustion zone and the other end in the vaporization zone of its appropriate mixing chamber. Some of the heat of combustion is thus carried back upstream into the swirl cans, to vaporize the fuel as it enters the vaporization zone in the swirl can, thereby improving vaporization and fuel mixing.
Official Gazette of the U.S. Patent Office

N78-10225* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROCESS OF FORMING CATALYTIC SURFACES FOR WET OXIDATION REACTIONS Patent
Robert Bruce Jagow, inventor (to NASA) (LMSC, Sunnyvale, Calif.) Issued 4 Oct. 1977 5 p Filed 10 May 1976 Supersedes N76-23387 (14 - 14, p 1777) Sponsored by NASA
(NASA-Case-MSC-14831-1; US-Patent-4,052,302; US-Patent-Appl-SN-685027; US-Patent-Class-210-63R; US-Patent-Class-210-71; US-Patent-Class-204-292; US-Patent-Class-252-472; US-Patent-Class-427-229) Avail: US Patent Office CSCL 07D

A wet oxidation process was developed for oxidizing waste materials, comprising dissolved ruthenium salt in a reactant feed stream containing the waste materials. The feed stream is introduced into a reactor, and the reactor contents are then raised to an elevated temperature to effect deposition of a catalytic surface of ruthenium black on the interior walls of the reactor. The feed stream is then maintained in the reactor for a period of time sufficient to effect at least partial oxidation of the waste materials. Official Gazette of the U.S. Patent Office

N78-10226 Pittsburgh Univ., Pa.
ELECTRICAL CONDUCTIVITY OF THE BINARY MIXTURES NEAR THE CRITICAL POINT AND MEASUREMENTS ON A MULTICOMPONENT FLUID NEAR THE TRICRITICAL POINT Ph.D. Thesis
Ching-Hao Shaw 1976 102 p
Avail: Univ. Microfilms Order No. 77-15160

The electrical conductivity of several liquid mixtures was measured near their respective critical points. The systems studied were pure phenol water, KC1 doped phenol water, and isobutyric acid water. The measurements spanned the reduced temperature range. All systems clearly showed the existence of a singular contribution to the conductivity. A least squares fit of the data to the equation, showed that the singularity can be characterized by a critical exponent. A possible explanation of the singularity is offered which uses percolation theory in the mean field limit.
Dissert. Abstr.

N78-10227 Illinois Univ., Urbana-Champaign.
MOLECULAR THERMODYNAMICS OF POLAR REACTIONS Ph.D. Thesis
Bruce Alan Newman 1977 268 p
Avail: Univ. Microfilms Order No. 77-14993

The influence of eleven solvents upon reaction rate was experimentally determined for the pyridine plus methyl iodide Menschutkin reaction. Solvent effects for this, and other polar and nonpolar reactions, were correlated with a linear free energy relationship, the Kirkwood equation, and the separation of cohesive energy model applied to the Bronsted-Bjerrum equation. Although the first two techniques were found to have limited applicability, the third is shown to be a promising method for prediction of solvent influence in chemical kinetics. The separation of cohesive energy density model, used with experimental rates, also provides new insight into the reaction transition state. Absolute activated complex activity coefficients were calculated for the pyridine-methyl iodide reaction in twelve solvents and for the triethylamine-ethyl iodide reaction in ten solvents. Dissert. Abstr.

N78-10228 Arizona Univ., Tucson.
CHEMICAL VAPOR DEPOSITION OF SILICON CARBIDE Ph.D. Thesis
Schyi-yi Wu 1977 173 p
Avail: Univ. Microfilms Order No. 77-13625

A thermodynamic study of vapor deposition of silicon carbide was made by means of computer calculations. Five systems containing different chemical constituents were investigated for various compositions and temperatures. The calculations yielded the concentrations of the gas phases which would be in equilibrium with solid SiC, with solid SiC and solid C, and with solid SiC and solid or liquid Si. The feasible reaction conditions for the deposition of SiC without deposition of Si or C were predicted. The experiments were carried out and compared with the theory. Epitaxial layers of a-SiC were grown on a-SiC substrates using the reaction conditions predicted by the theory. Dissert. Abstr.

N78-10229 Pittsburgh Univ., Pa.
STUDIES IN ULTRAVIOLET AND X-RAY ELECTRON SPECTROSCOPY Ph.D. Thesis
Richard John Colton 1976 242 p
Avail: Univ. Microfilms Order No. 77-15174

For substituted benzenes, the electronic interaction between the phenyl group and its unsaturated substituents results in a redistribution of the valence electrons. Ultraviolet Photoelectron Spectroscopy (PES) allows measurement and identification of the ionization energies of the perturbed pi electrons of the phenyl group as well as the pi and/or n electrons of the substituents. PE data for sulfur halides was used to interpret their visible and near-ultraviolet electronic absorption spectra. Photoionization cross sections were used as a function of excitation energy in assigning PE spectra. Both PES and X-ray Photoelectron Spectroscopy (XPS) were used to investigate the solid state electronic structure of some materials of high-potential-energy content, i.e., azides and amines. Using XPS data alone, the solid state electronic structure of tungsten carbide was investigated and correlations were drawn about its catalytic behavior compared to that of platinum. Changes in the electronic structure of tungsten were monitored as a function of chemical substitution. Finally, color center formation in thin film transition metal oxides was studied by XPS. Dissert. Abstr.

N78-10230 Rhode Island Univ., Kingston.
INFRARED STUDIES OF THE ADSORPTION OF CARBON MONOXIDE AND NITRIC OXIDE ON SUPPORTED RUTHENIUM, SUPPORTED PLATINUM AND SUPPORTED BIMETALLIC RUTHENIUM-PLATINUM SAMPLES Ph.D. Thesis
Mary Frances Brown 1976 159 p
Avail: Univ. Microfilms Order No. 77-13476

The infrared spectra of CO and NO adsorbed on both the reduced and oxidized forms of a 6% Ru-silica sample were recorded. Assignments of the various bands observed in these infrared spectra were made. A comparative infrared study of the interactions that occur when CO and NO are co-adsorbed on a 6% Ru-silica sample and a 6% Pt-silica sample was also made. The adsorption of CO and NO and the relative stability of adsorbed CO and adsorbed NO on a bimetallic Ru-Pt sample (62 at % Ru) were studied using infrared spectroscopy. Dissert. Abstr.

N78-10231 Brown Univ., Providence, R. I.
A STUDY OF FLAME SUPPRESSION ON CYLINDRICAL FUEL RODS Ph.D. Thesis
Michael William Little 1976 143 p
Avail: Univ. Microfilms Order No. 77-14158

The propagation/extinction process for solid fuel fires was studied. Propagation velocity was found to be a linear function of oxygen mass fraction for oxygen concentrations equal to and less than the atmospheric value. Suppression of the flame by nitrogen and CF3Br was studied; CF3Br was found to be more effective than nitrogen when compared on a mass basis. Flame velocity was reduced significantly by substituting CF3Br for nitrogen at constant oxygen mass fraction. Temperature measurements were made on the surface and within the fuel samples. An energy balance was constructed using these measurements to evaluate conduction heat transfer and enthalpy of the fuel ahead of the flame. An analysis of conduction in the fuel was presented and utilized to illustrate the approach to extinction as surface heat inputs change. Dissert. Abstr.

N78-10232*# Arizona Univ., Tucson. Optical Sciences Center.
DESIGN, DEVELOPMENT, TEST, AND EVALUATION OF AN AUTOMATED ANALYTICAL ELECTROPHORESIS APPARATUS Technical Report, 17 May 1976 - 31 Aug. 1977
Peter A. Bartels and Milan Bier 23 Sep. 1977 64 p
(Contract NAS8-31948)
(NASA-CR-150443) Avail: NTIS HC A04/MF A01 CSCL 07D

An Automated Analytical Electrophoresis Apparatus (AAEA) was designed, developed, assembled, and preliminarily tested. The AAEA was demonstrated to be a feasible apparatus for automatically acquiring, displaying, and storing (and eventually analyzing) electrophoresis mobility data from living blood cells. The apparatus and the operation of its major assemblies are described in detail. Author

N78-10233*# Grumman Aerospace Corp., Bethpage, N.Y.
INVESTIGATION OF HYDROGEN-AIR IGNITION SENSITIZED BY NITRIC OXIDE AND BY NITROGEN DIOXIDE Final Report
M. Slack and A. Grillo Washington NASA Oct. 1977 43 p refs
(Contract NAS1-14348)
(NASA-CR-2896) Avail: NTIS HC A03/MF A01 CSCL 07D

The sensitization of stoichiometric hydrogen-air ignition by NO, NO2 and a mixture of NO and NO2 was investigated behind reflected shock waves in a shock tube. Induction times were measured in pressure range 0.27 to 2.0 atm, temperature range 800 to 1500 K, and for NO or NO2 mole percent between 0.0 and 4.5. Addition of both NO and NO2 reduced the measured induction times. The experimental data are interpreted in terms of H2-O2-NO(x) oxidation reaction mechanisms. The influence of NO(x) upon a supersonic combustion ramjet combustor test, conducted in an arc-heated facility, is assessed. Author

N78-10234# Case Western Reserve Univ., Cleveland, Ohio. Electrochemistry Research Lab.
AN OVERVIEW OF THE ELECTROCHEMICAL INTERFACE AND OPTICAL SPECTROSCOPIC STUDIES
Ernest Yeager 1 Jun. 1977 57 p refs
(Contract N00014-75-C-0953)
(AD-A042488; TR-47) Avail: NTIS HC A04/MF A01 CSCL 07/4

This paper reviews the present understanding of the structure of electrochemical interfaces and identifies the types of information which optical spectroscopic measurements may be able to contribute. Particularly challenging problems are the structure of the solvent in the compact layer and the nature of the interactions of adsorbed species with the electrode surface. So far, little information has been derived from optical measurements concerning these problems. Author (GRA)

N78-10235# University of Southern Calif., Los Angeles. Dept. of Chemistry.
MEDIUM EFFECTS ON TRANS-CR(NH3)2(NCS)4(-) PHOSPHORESCENCE
Adolfo R. Gutierrez and Arthur W. Adamson Jun. 1977 23 p refs
(Contract N00014-76-C-0548)
(AD-A042793) Avail: NTIS HC A02/MF A01 CSCL 07/2

Lifetimes for doublet state emission of reineckate ion, trans-Cr(NH3)2(NCS)4(-), in room temperature solution are reported for twenty solvent media and as a function of solvent composition in water-acetonitrile mixtures. These vary from 6 nsec in water to 204 nsec in sulfolane (and 460 nsec for the solid potassium salt). Apparent activation energies for emission were determined in twelve systems and range from 10 to 18 kcal/mole. Both the emission spectrum and the doublet state absorption spectrum are given for acetonitrile as solvent. The excited state kinetic scheme is discussed in terms of these and other data, and it appears likely that at room temperature the emission lifetimes are determined primarily by the rate at which the doublet excited state undergoes chemical reaction. Author (GRA)

N78-10236# Coast Guard Research and Development Center, Groton, Conn.

FIRE EXPOSURE TESTS OF POLYETHYLENE AND FIFTY-FIVE GALLON STEEL DRUMS LOADED WITH FLAMMABLE LIQUIDS, PHASE 1 Final Report

R. C. Richards and K. T. White Sep. 1976 145 p

(AD-A043803; CGR/DC-16/76; USCG-D-116-76) Avail: NTIS HC A13/MF A01 CSCL 13/4

Tests were conducted to compare the performance (resistance) of steel and polyethylene drums to fire exposure both singly and in arrays using JP-4 (aviation fuel) and Acetone as flammable liquid cargoes. The internal pressure, internal temperature, external temperature, time to failure and method of failure were recorded for each drum type tested. Polyethylene drums failed by melting, burning or softening and then discharging their liquid cargoes under load pressure. Steel drums failed due to increased temperature of the steel and increased internal pressure causing the double rolled seam at top or bottom to unroll resulting in catastrophic failure of the drum by jetting and/or explosion.

Author (GRA)

N78-10237# Naval Intelligence Support Center, Washington, D. C. Translation Div.

ACOUSTIC SPECTROMETRY

Samuil Borisovich Stopskiy 31 May 1977 54 p Transl. into ENGLISH from Energiya (USSR), no. 34, 1972 p 24-36, and 98-136

(AD-A043711; NISC-Trans-3933) Avail: NTIS HC A04/MF A01 CSCL 14/2

Presented are methods for determining the dynamic condition of machines and mechanisms based on the frequency spectrum of the noise. Examples are given for the use of noise (oscillations) to diagnose defects in machines. Analyzed in detail in the book are the principles of the construction and design of the frequency spectrum analyzers used in acoustic spectrometry. Practical questions of spectrum analyzer design are elucidated. The book is intended for engineering and technical workers engaged in the diagnosis of machines without disassembly and the measurement of nonelectrical quantities using radioelectronic methods.

GRA

N78-10238# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.

CHEMILUMINESCENCE SPECTRA AND PHOTON YIELDS FOR SEVERAL Sn-OXIDIZER REACTIONS Interim Report

Gene A. Capelle and Colan Linton 29 Jul. 1977 27 p refs Prepared in cooperation with California Univ., Santa Barbara

(Contract F04701-76-C-0077; DARPA Order 2843)

(AD-A043320; TR-0077(2751)-1) Avail: NTIS HC A03/MF A01 CSCL 20/5

Tin vapor has been reacted with N2O, NO2, O2, and F2 to produce SnO and SnF in a flame. Reactions of Sn with O2 and NO2 produced very weak chemiluminescence, whereas Sn + Br2 and Cl2 produced no detectable light emission. The highest photon yield measured was 6.7% for SnO emission that resulted from the reaction of Sn + N2O in Ar at a Sn concentration of 3 X 10 to the 13th power. The maximum SnF yield measured was 0.3% for Sn F2. The spectral character of the SnO chemiluminescence generated in the Sn + N2 O reaction was found to be a strong function of pressure (0.5 to 25 Torr) and carrier gas identity (Ar, He, N2) in the flow-tube reaction system.

Author (GRA)

N78-10239# Case Western Reserve Univ., Cleveland, Ohio. Ultrasonics Research Lab.

GENERATION OF ULTRASOUND AT METAL ELECTROLYTE INTERFACES

Frank Borsay and Ernest Yeager 4 Aug. 1977 26 p refs

(Contract N00014-75-C-0557; NR Proj. 384-305)

(AD-A043496; TR-44) Avail: NTIS HC A03/MF A01 CSCL 09/1

When a radiofrequency potential is applied to an electrode such as gold in an electrolyte, ultrasound is generated at the interface. This effect is attributed to changes in the volume of the solution adjacent to the metal and can be used to study the structure of the interface. Preliminary measurements are reported as a function of the d.c. electrode potential. The effect is particularly sensitive to adsorbed species such as organics. Various means for enhancing the effect are discussed.

Author (GRA)

N78-10240# Environmental Sciences Research Lab., Research Triangle Park, N.C.

EFFECT OF SELECTED PARAMETERS ON PREDICTIONS OF A PHOTOCHEMICAL MODEL

Marcia C. Dodge Jun. 1977 53 p refs

(PB-269858/7; EPA-600/3-77-048) Avail: NTIS HC A04/MF A01 CSCL 07E

A kinetics model was developed for use in designing control requirements for ozone reduction in urban areas. Selected parameters were varied which included: (1) solar energy, (2) dilution rate, (3) post nine a.m. emissions, and (4) hydrocarbon composition of six to nine a.m. emissions. Based on the results of the simultations for each of these parameters, O3 isoplets as a function of initial non-methane hydrocarbon and NOx were constructed. A comparison of the degree of hydrocarbon control predicted to achieve the air quality standard for O3 was made for each set of isopleths. It was found that the predictions of the model are largely insensitive to the parameters investigated.

GRA

N78-10241# Massachusetts Inst. of Tech., Oak Ridge, Tenn. School of Chemical Engineering Practice.

CROSS-FLOW FILTRATION WITH DYNAMICALLY-FORMED MEMBRANES

F. O. Awokoya and S. G. DeCicco 21 Dec. 1976 27 p refs

(Contract W-7405-eng-26)

(ORNL/MIJ-247) Avail: NTIS HC A03/MF A01

Cross-flow filtration using dynamically formed hydrons zirconium (IV) oxide membranes formed on two types of porous polymer substrate was investigated. The dependence of dodecane rejection and water flux on circulation velocity, formation pressure, operating pressure, and pressure history was experimentally studied. Rejections were as high without the dynamically formed membranes as with them. Flux was found to decrease with increasing formation pressure. The influence of circulation velocity on flux varies depending on the operating and formation pressure. Pressure and circulation velocity hysteresis experiments produced irreversible reductions in flux. ERA

N78-10242# Woods Hole Oceanographic Institution, Mass.

ANALYSIS OF SEA WATER BY DIFFERENCE CHROMATOGRAPHY

P. C. Mangelsdorf, Jr. Feb. 1977 25 p

(Contract EY-76-S-02-3119)

(COO-3119-10) Avail: NTIS HC A02/MF A01

The principal results obtained were: (a) the development of anion analysis by difference chromatography to the extent that S04(-2)/C1(-) can be determined to better than 0.1 percent using an 0.5 ml seawater sample, (b) the determination of the Ion-exchange cation complements of a variety of sediments in river water and in seawater, and (c) the discovery of a simple technique for the qualitative removal of NH4(+) from seawater samples without altering the ratios of the other cations. ERA

N78-10243# Ames Lab., Iowa.

SODIUM TUNGSTEN BRONZE THIN FILMS BY *rf* SPUTTERING M.S. Thesis

J. W. Anderegg Mar. 1977 64 p refs

(Contract W-7405-eng-82)

(IS-T-753) Avail: NTIS HC A04/MF A01

Polycrystalline Na/sub x/WO3 films were produced by rf sputtering. Films of low x-value resulted when co-sputtering WO3 on a Na/sub 0.83/WO3 target, and Na/sub 0.83/ on WO3 target. Films of high x and of mixed phase were produced by sputtering a powder mixture of Na2WO4 and WO3 on a tungsten target. Of the sputtering parameters studied, the substrate temperature is the most critical with temperatures above 500 C producing films which were cubic in structure with only a small amount of Tetragonal I. The presence of oxygen up to 3 percent by volume had minimal effect on film quality or x-value. Auger, electron microprobe, SIMS, SEM, X-ray diffraction, and sheet resistivity techniques were used in characterizing these films. Resistivity of the films was a factor of 10 higher than the bulk crystalline data for Na/sub 0.83/WO3. ERA

N78-10244# Brookhaven National Lab., Upton, N. Y.
NICKEL BASED ALLOYS AS ELECTROCATALYSTS FOR OXYGEN EVOLUTION FROM ALKALINE SOLUTIONS
P. W. T. Lu and S. Srinivasan Jan. 1977 39 p refs
(Contract EY-76-C-02-0016)
(BNL-22275) Avail: NTIS HC A03/MF A01

The slowness of the oxygen evolution reaction is one of the main reasons for significant energy losses in water electrolysis cells and secondary air-metal batteries. Mechanically polished alloys of nickel with Ir, Ru or W and Ni-Ti intermetallic compounds were studied as oxygen electrodes. Steady-state potentiostatic and slow potentiodynamic (at 0.1 mV/s) methods were employed to obtain the electrode kinetic parameters for the oxygen evolution reaction in 30 wt. percent KOH at 80 C. The peaks for the formation or reduction of oxygen-containing layers appearing on the pure metals are not always found on the alloys. The maximum decreases in oxygen overpotential at an apparent current density of 20 mA per sq cm (as compared with that on Ni) were found for the alloys of 50Ni-50Ir and 75Ni-25Ru and the intermetallic compound Ni3Ti. On the long-term polarization in the potential region of oxygen evolution, the oxygen-containing layers on Ni-Ir or Ni-Ru alloys are essentially composed of nickel oxides instead of true mixed oxide films of two components. The present work confirms that, possibly because of coverage by oxide films, there is no direct dependence of the electrocatalytic activities of the alloys on their electronic properties. ERA

N78-10245# European Space Research and Technology Center, Noordwijk (Netherlands). Quality and Reliability Div.
DETECTION OF ORGANIC CONTAMINATION OF SURFACES BY INFRARED SPECTROSCOPY TECHNIQUES
Paris ESRO Sep. 1972 11 p
(ESRO-PSS-15/QRM-05T-Issue-1) Avail: NTIS HC A02/MF A01

Procedures for performing direct and indirect methods of contamination monitoring, on or near critical spacecraft areas, in vacuum chambers and in clean rooms, by means of infrared spectroscopy are described. Directions for the interpretation of the results are given. ESA

N78-10246# Aerospace Corp., El Segundo, Calif.
EFFICIENCY OF GAS-WALL REACTIONS IN A CYLINDRICAL FLOW REACTOR Interim Report, Jun. 1971 - Jan. 1973
Henry S. Judeikis and Seymour Siegel May 1977 25 p refs
(Grant EPA-R-802687)
(PB-269005/5; ATR-73(7256)-2; EPA-600/3-77-043) Avail: NTIS HC A02/MF A01 CSCL 07D

Expressions are given for the concentration of a dilute reactive gas mixed with an inert carrier gas as a function of the radial and longitudinal distances in a cylindrical reactor and the reaction efficiency. The reaction efficiency is defined as the fraction of gas-wall collisions that leads to the disappearance of the reactive gas from the gas phase. The solutions presented here are applicable for all values of reaction efficiencies. In addition to the solution of Fick's second law of diffusion as applied here (with an additional term for flow in the cylinder), a one-dimensional random walk analysis is also applied. This combination leads to the conclusion that, for a given set of experimental conditions, the reaction efficiency can be uniquely determined only if it lies within a certain range of values. Small values of the reaction efficiency will produce insufficient reaction and large values will yield diffusion-limited results. GRA

N78-10247# Argonne National Lab., Ill.
DEVELOPMENT OF RADIOCHEMICAL METHOD FOR ANALYZING RADON GAS IN URANIUM MINE ATMOSPHERES Final Report, 3 Feb. 1975 - 31 Mar. 1976
L. Stein, J. A. Shearer, F. A. Hohorst, and F. Markun 14 Jan. 1977 75 p refs
(Contract DI-BM-HO-252019)
(PB-269900/7; ANL-USBM-1; BM-OFR-118-77) Avail: NTIS HC A04/MF A01 CSCL 07E

A quantitative analysis for radon gas in underground uranium mines, measures volume of air drawn by a pump through a drying tube and a cartridge containing dioxygenyl hexafluoroantimonate reagent. Radon is captured as a nonvolatile product. After radioactive equilibrium has been established between radon and its short-lived daughters (approximately 4 hours), the gamma emission of the cartridge is measured with a scintillation counter. The amount of radon is then calculated from the gamma emission rate. The effect of cartridge geometry, reagent load, and air flow rate upon collection efficiency and counting efficiency is reported. GRA

N78-10248# United Technologies Research Center, East Hartford, Conn.
REVIEW OF LASER RAMAN AND FLUORESCENCE TECHNIQUES FOR PRACTICAL COMBUSTION DIAGNOSTICS Final Report, Oct. 1976 - Mar. 1977
A. C. Eckbreth, P. A. Bonczyk, and J. F. Verdieck Jun. 1977 175 p refs
(Contract EPA-68-02-2176)
(PB-269653/2; EPA-600/7-77-066) Avail: NTIS HC A08/MF A01 CSCL 21B

Spontaneous and near-resonant Raman scattering, laser fluorescence, and coherent anti-Stokes Raman scattering (CARS) were examined. For clean flame diagnostic or probing or environments with modest particulate levels, spontaneous Raman scattering is very attractive. Laser fluorescence is capable of species concentration measurements to 10's of ppm for selected molecules whose absorptions can be saturated. CARS appears to be capable of successful thermometry and majority constituent measurements in practical flame environments. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N78-10249 Brown Univ., Providence, R. I.
DYNAMIC CRACK PROPAGATION STUDIES IN 1020 STEEL Ph.D. Thesis
Zdenek J. Bilek 1976 93 p
Avail: Univ. Microfiims Order No. 77-14090

The dynamics of crack propagation in double cantilevered beam specimens with various end loading conditions was solved analytically, including wave effects, within the limits of Bernoulli-Euler beam theory. Hamilton's equation as applied to the reversible and nonreversible fracture surface energy, the beam's strain energy, and kinetic energy gave a critical bending moment that moves with the crack tip. The critical bending moment was the fracture criterion. The magnitude of the critical bending moment may be dependent on the crack velocity. The crack length vs. time relation for different fracture surface energies was tractable from solutions of Bernoulli-Euler beam theory for constant tip end loadings with a bending moment, a displacement rate or a force. Dissert. Abstr.

N78-10250 Michigan Technological Univ., Houghton.
STRUCTURE SENSITIVITY OF ALUMINUM-ZINC ALLOYS AND THE EFFECT OF MINOR THIRD COMPONENTS Ph.D. Thesis
Allen David Ackerman 1976 223 p
Avail: Univ. Microfilms Order No. 77-15302

Decomposition in several Al-Zn, Al-Zn-Mg, and Al-Zn-Cu alloys was studied by X-ray diffractometry, optical microscopy and

scanning electron microscopy. Hardness and tensile data were obtained as a function of heat treatment and test temperature in several alloys. The effect of magnesium additions was to delay the formation of the equilibrium phases by four orders of magnitude in time, and to drastically change the morphology of the transformation product. Tensile and metallographic data from several binary aluminum-zinc alloys with compositions from 37 to 60 at. pct. zinc showed dramatically the effect of heat treatment on the structure and properties of these materials. All alloys within this composition range were found to be highly plastic if given the proper heat treatment. Dissert. Abstr.

N78-10251 Columbia Univ., New York.
CREEP AND STRESS RUPTURE BEHAVIOR OF POLY-CRYSTALLINE NICKEL-BASE SUPERALLOYS Ph.D. Thesis
Kwaku Aning 1977 122 p
Avail: Univ. Microfilms Order No. 77-14775

An empirical understanding of creep and stress rupture behavior of a representative polycrystalline nickel base superalloy in two environments, air and vacuum was developed. The results include temperature and stress dependence of the steady state creep rate and stress rupture relations. It was shown that creep activation energy for polycrystalline nickel base superalloys in a temperature range, about 760 C, where there are no creep induced microstructural changes, is not high. It is only slightly higher than that of self diffusion in nickel. This creep activation energy value is consistent with the self-diffusion activation energy measured for a nickel base alloy system with a dispersion of ordered gamma prime precipitates. The lower creep activation energy is also consistent with the coarser dislocation substructure developed during creep in the polycrystalline alloy reported.
Dissert. Abstr.

N78-10252 Illinois Univ., Urbana-Champaign.
DEFORMATION SUBSTRUCTURE AND SLIP SYSTEMS IN DIRECTIONALLY SOLIDIFIED Ni3Al(GAMMA)-Ni3Nb (DELTA) EUTECTIC COMPOSITE TO 600 C Ph.D. Thesis
Prabir Ranjan Bhowal 1977 146 p
Avail: Univ. Microfilms Order No. 77-14929

Mechanical and thin-foil electron microscopic studies were made in the directionally solidified eutectic composite Ni(3)Al (gamma') Ni(3)Nb (delta) having approximately 2 microns wide lamellae. Specimens with tensile axis along the growth direction were deformed at temperatures 25 to 600 C at a strain sensitivity approximately 5 x 10 to the -6 power. At all temperatures gamma' suffered microyielding at a relatively low stress approximately 100 MPa but strain hardened rapidly to a strain of about 6 x 10 to the -3 power at which either fracture at room temperature or macroyielding at elevated temperatures occurred. An exhaustion hardening model was suggested where deformation was inhomogeneous with only a limited amount of dislocation multiplication. Macroyielding at elevated temperatures was associated with the formation of delta twins which were accomodated by deformation bands in gamma' and the material showed substantial ductility. Dissert. Abstr.

N78-10253 Brown Univ., Providence, R. I.
AN INVESTIGATION OF THE ROLE OF THE SURFACE IN THE MECHANICAL BEHAVIOR OF POLYCRYSTALLINE TITANIUM Ph.D. Thesis
Elaine Irene Savage 1976 69 p
Avail: Univ. Microfilms Order No. 77-14186

A drop in flow stress on the order of 5% and an increase in creep rate are observed in a polycrystalline commercial purity titanium sheet, 0.050 in. thick, undergoing anodic dissolution in a methanol - 10% nitric acid solution. Effects were observed using a stress relaxation technique. The increase in creep rate was related to a decrease in thermal activation energy dependent upon the magnitude of the anodic current. The value of the activation energy was found to be fairly constant within the range of grain size investigated. Dissert. Abstr.

N78-10254 Johns Hopkins Univ., Baltimore, Md.
SOLIDIFICATION KINETICS AND NON-EQUILIBRIUM PHASE FORMATION IN RAPID CONDUCTION COOLING Ph.D. Thesis
Jonathan A. Dantzig 1977 111 p
Avail: Univ. Microfilms Order No. 77-15069

A model for alloy solidification, stimulated by results from rapid liquisol quenching experiments, was proposed. The model incorporated kinetic processes into the liquid-solid interfacial conditions by introducing a kinetic delay time for solidification. The ratio of this kinetic delay time to the thermal diffusion time in a slab became a dimensionless parameter in determining the motion of the interface with time, and perturbation analyses for very large and very small values of the parameter were constructed for a problem with simple boundary conditions. A critical value of the parameter for a given set of experimental conditions was identified, above which nonequilibrium phases were formed, and below which the equilibrium products were formed. Comparison of theoretical predictions with experimental results were made and are in agreement for several known cases. Dissert. Abstr.

N78-10255 Michigan Technological Univ., Houghton.
EFFECTS OF PULSE AMPLITUDE AND DURATION ON SHOCK DEFORMATION OF ALPHA-Cu-Ge Ph.D. Thesis
Edward Thomas Marsh 1976 167 p
Avail: Univ. Microfilms Order No. 77-15304

A Cu 8.7 a/o Ge alloy was shock loaded at shock pulse durations of approximately 0.05, 0.10, 0.50, 2.0, and 3.0 microns with shock pressures that ranged in value from 16 to 469 kbar. The hardness changes were measured, and the changes in substructure were examined. There was an apparent minimum in the hardening at intermediate shock pulse durations near 0.5 microns the hardening was equivalent to that obtained at long durations near 1.0 microns. X-ray diffraction methods were used to measure the effective particle size, rms microstrain, and the stacking and twin fault probabilities. The formation of extremely fine and intersecting twins was found to be the cause for the hardening at the very short durations. At longer durations the hardening is related to a dislocation and twin structure, the complexity of which increases with duration. Dissert. Abstr.

N78-10256 Michigan Technological Univ., Houghton.
EFFECTS OF MICROSTRUCTURE AND ENVIRONMENT ON FATIGUE CRACK PROPAGATION IN AISI-4340 STEEL Ph.D. Thesis
Dennis Wayne Stephens 1976 268 p
Avail: Univ. Microfilms Order No. 77-15301

The fatigue crack growth behavior of several high strength microstructures of AISI-4340 in an effort to elucidate the roles of microstructural variations and environment in the fatigue cracking process was examined. The fracture mechanics approach to fatigue was employed to determine the crack growth rate dependence on stress intensity factor range, delta K, at constant stress ratio and frequency. Duplicate compact tension specimens were prepared and tested to characterize the fatigue behavior of each microstructure in argon or 3 percent NaCl environments. Discussion of the observed behavior was based on equivalent yield strengths, with isothermally transformed lower bainite and tempered martensite compared at a nominal strength of 210 ksi. A similar comparison was made of tempered martensite and tempered lower bainite at a yield strength of about 180 ksi.
Dissert. Abstr.

N78-10257 Michigan Technological Univ., Houghton.
PRECIPITATION HARDENING IN SINGLE CRYSTALS OF A Bcc Ti-V-Si ALLOYS Ph.D. Thesis
Steven Michael Tuominen 1975 95 p
Avail: Univ. Microfilms Order No. 77-15305

The age hardening behavior in beta-phase Ti-V-Si alloy single crystals is examined, relating microstructure to mechanical properties and examining the relationships between hardening mechanisms. The dependence of the yield stress upon aging time at 570 deg C for solution-treated Ti-40 a/o V + 1 a/o Si single crystals shows two maxima which are caused by silicon induced precipitation. Transmission electron microscopy shows that two precipitate phases exist; both small, bcc precipitates of an unknown composition and larger, rod-shaped, silicon-rich precipitates with a hexagonal crystal structure are present. The lattice parameters of the hexagonal precipitates do not match those of any silicide compounds. Nucleation and growth of the precipitate phases are discussed in terms of their morphology and growth kinetics. Dissert. Abstr.

N78-10258 Illinois Univ., Urbana-Champaign.
A STUDY OF THE TRANSITION FROM NON-THERMOELASTIC TO THERMOELASTIC BEHAVIOR IN Fe-Pt MARTENSITES Ph.D. Thesis
Minoru Umemoto 1977 252 p
Avail: Univ. Microfilms Order No. 77-15029

The change and transition process in transformation kinetics from a nonthermoelastic to thermoelastic type accompany an increase in the degree of order in the parent phase in Fe-Pt alloys near the stoichiometric composition Fe3Pt were investigated using Fe-23, 24 and 25 at. pct Pt alloys. The thermal hysteresis, M sub s temperature, martensite tetragonality, and transformation volume change were measured for specimens with various degrees of order. Correlations among the measured values of the quantities are discussed. It is pointed out that in Fe-Pt alloys the martensite tetragonality, or equivalently the degree of order of the parent phase, is not the dominant factor which controls the thermoelastic nature. The M sub s temperature plays an important role in the transformation kinetics, and to obtain a thermoelastic transformation in Fe-Pt alloys the M sub s temperature must be lower than a certain value. Dissert. Abstr.

N78-10259 Texas Univ., Arlington.
PHASE RELATIONSHIP STUDIES IN THE COPPERGALLIUM-LEAD AND COPPER-SILVER-LEAD TERNARY ALLOY SYSTEMS Ph.D. Thesis
Clyde Gilpin Ford 1976 426 p
Avail: Univ. Microfilms Order No. 77-14424

The two ternary metals systems, copper-gallium-lead and copper-silver-lead were investigated to determine phase relationships. Metallography of all samples was investigated, using standard metallurgical polishing, etching, and photographic microscopic methods. Metallurgical results are discussed in some detail. Microhardness (Kentron) readings were recorded on the various samples and the relationships to possible bonding effects were evaluated. Results indicate a ternary phase very near and parallel with the gallium-lead binary side of the copper-gallium-lead ternary system. Hardening mechanisms were found in the alpha copper and alpha lead phase fields of the copper-gallium-lead ternary system. The copper-silver-lead system was proved to be a simple ternary eutectic, with the eutectic temperature at 200 C. Dissert. Abstr.

N78-10260 Rensselaer Polytechnic Inst., Troy, N. Y.
FATIGUE OF VANADIUM-HYDROGEN ALLOYS Ph.D. Thesis
Kyung Sub Lee 1976 150 p
Avail: Univ. Microfilms Order No. 77-13711

The fatigue behavior of unalloyed 99.8% vanadium and three vanadium hydrogen alloys, 132, 400 and 1,000 ppm hydrogen, were determined in both stress control and strain control at room temperature. In addition, stress control tests were conducted on vanadium and the 1,000 ppm hydrogen alloy at 400 C and 600 C in air. S-N data obtained from stress controlled fatigue tests revealed a pronounced improvement in fatigue life for hydrided vanadium, but little or no effect for 132 ppm hydrogen in solution. Similarly, strain control tests showed no effects of hydrogen in solution on either cyclic hardening for fatigue life, in marked contrast to decrease in low cycle life for vanadium containing hydride plates. Dissert. Abstr.

N78-10261 Rensselaer Polytechnic Inst., Troy, N. Y.
THE VOLUME EXPANSION ACCOMPANYING THE MARTENSITE TRANSFORMATION IN STEELS Ph.D. Thesis
James Meir Moyer 1976 126 p
Avail: Univ. Microfilms Order No. 77-13712

A dilatometric investigation was conducted to determine the individual effects of carbon, nickel, chromium, manganese, silicon, molbydenum, and cobalt on the volume expansion accompanying the martensite transformation in Fe-C and Fe-C-X alloys. It was found that the effects of alloying elements on the volume expansion measured at the M(s) temperature can be expressed as the sum of two factors: first, a temperature factor that is positive for elements that lower the M(s) and negative for cobalt, which raises the M(s); and second, a lattice parameter factor that is positive for austenite stabilizing elements and negative for gamma loop formers. From these data, an empirical equation was developed that can be used to predict the volume expansion of ferrous alloys at their temperatures. Dissert. Abstr.

N78-10262 Columbia Univ., New York.
THE ANISOTROPY DEPENDENCE OF FERROMAGNETIC DOMAIN WALL WIDTHS IN CRYSTALLINE AND AMORPHOUS METALS Ph.D. Thesis
Jordie Marti 1977 104 p
Avail: Univ. Microfilms Order No. 77-14829

The techniques of Lorentz electron microscopy were used to study the behavior of ferromagnetic domain wall widths as a function of the magnetic anisotropy constant K and the foil thickness D. This was done by varying the temperature T in crystalline iron and in amorphous Fe75P15C10 for various D's. The results are compared with existing theories. An increase in wall width with temperature was observed in crystalline iron and was explained by assuming the width of the wall to be an explicit function of both the anisotropy constant K(T) and the temperature T. After removing the explicit temperature dependence, the experimental results yielded an expression for the wall width. An increase in wall width with temperature was also observed for walls in amorphous Fe75P15C10. From the measured wall structures we obtained an approximate value of 100,000 erg/cc for the effective anisotropy constant of this amorphous alloy. Dissert. Abstr.

N78-10263# Polymet Corp., Cincinnati, Ohio.
PRECISION EXTRUSION OF HOLLOW TURBINE VANES OF OXIDE DISPERSION STRENGTHENED NICKEL CHROMIUM ALLOY BY THE FILLED BILLET METHOD Final Report, 13 Mar. 1974 - 15 Nov. 1975
James G. Hunt Jan. 1977 63 p
(Contract F33615-74-C-5069; AF Proj. 7351)
(AD-A041783; AFML-TR-76-98) Avail: NTIS HC A04/MF A01 CSCL 21/5

Precision extrusion of hollow vanes of oxide dispersion strengthened nickel chromium alloys was demonstrated on subscale specimens using a modification of the filled billet method. The desired -100 = microstructure was attained after heat treatment of extruded vanes. Stress rupture life at 2000 F at 11 ksi exceeded 100 hours. A full scale processing sequence based on subscale results is proposed. Author (GRA)

N78-10264# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
THE FATIGUE BEHAVIOR OF HIGH STRENGTH ALUMINUM ALLOYS UNDER CATHODIC CHARGING CONDITIONS
E. F. Smith, R. Jacko, and J. D. Duquette Jul. 1977 10 p refs
(Contract N00014-75-C-0466)
(AD-A042606) Avail: NTIS MF A01 CSCL 11/6

Cathodic charging of cyclically stressed high aluminum alloys results in large decreases in fatigue resistance. These observations, coupled with tensile test experiments which show interrupted flow, suggest that hydrogen, interacting with dislocations, effectively reduces plasticity in the region near the crack tip.
Author (GRA)

N78-10265# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
HIGH TEMPERATURE EUTECTIC COMPOSITES: MECHANICAL BEHAVIOR
N. S. Stoloff 10 Jul. 1977 64 p refs
(Contract N00014-75-C-0503)
(AD-A042392; TR-3) Avail: NTIS HC A04/MF A01 CSCL 11/6

The mechanical behavior of nickel and cobalt-base eutectic alloys is reviewed. Tensile compressive creep, impact and fatigue data are described and critically evaluated. Prospects for application of these alloys in gas turbines are described.
Author (GRA)

N78-10266# Naval Ship Research and Development Center, Bethesda, Md.
EFFECTIVENESS OF FERROUS SULFATE AS AN INHIBITOR FOR SULFIDE-INDUCED CORROSION OF COPPER-NICKEL ALLOYS

Harvey P. Hack Jul. 1977 37 p
(AD-A042214; DTNSRDC-77-0072) Avail: NTIS HC A03/MF A01 CSCL 11/6

A large program is ongoing to investigate the causes and solutions for accelerated corrosion of ships piping systems experienced during and after outfitting in polluted brackish harbor waters. As part of this program, various ferrous sulfate inhibitor treatments were evaluated in laboratory exposures of 90-10 and 70-30 copper-nickel specimens to seawater and seawater containing 0.2 parts per million sulfide. Weight loss, maximum thickness loss, and instantaneous corrosion rate data were obtained. Neither pretreatment by the inhibitor before sulfide exposure, nor intermittent inhibitor treatment during sulfide exposure significantly reduced the sulfide-induced attack on either alloy. Treatment after sulfide exposure did not reduce the sulfide-induced attack on 90-10 copper-nickel and only partially reduced the attack on 70-30 copper-nickel. Continuous treatment completely eliminated the attack on both alloys, probably because the inhibitor stripped the harmful sulfides from solution. Results of these exposures should not be generalized to predict the action of the inhibitor against lower sulfide concentrations which have been measured in harbor waters. Author (GRA)

N78-10267# Pratt and Whitney Aircraft, West Palm Beach, Fla. Government Products Div.
WEAR RESISTANT COATINGS FOR TITANIUM ALLOYS Final Report, 15 Mar. 1976 - 15 Mar. 1977
B. A. Manty and H. R. Liss Mar. 1977 74 p refs
(Contract N00019-76-C-0342)
(AD-A042443; FR-8400) Avail: NTIS HC A04/MF A01 CSCL 11/6

Techniques for applying chromium-molybdenum alloys to titanium alloy substrates were developed and the resulting systems evaluated as protective coatings. Deposition techniques including electroplating and sputtering were considered and diffusion properties studied. A coating alloy containing 1% molybdenum was shown to greatly improve the wear resistance. Erosion, oxidation and stress corrosion properties were also improved. The coatings system had no apparent effect on fatigue properties of Ti 8Al-1V-1Mo at either room temperature or 315 C.
Author (GRA)

N78-10268# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
SURFACE STUDIES OF ANODIC ALUMINUM OXIDE LAYERS FORMED IN PHOSPHORIC ACID SOLUTIONS Final Report, Jul. 1975 - Sep. 1976
Neil T. McDevitt, William L. Baun, Gary Fugate, and James S. Solomon May 1977 34 p refs
(AF Proj. 2419)
(AD-A042386; AFML-TR-77-55) Avail: NTIS HC A03/MF A01 CSCL 11/3

Phosphoric acid generates a composite oxide with a dense, nonporous layer forming on the aluminum anode, and then a porous layer forming on top. The nonporous layer forms a continuous film and should offer the most protection to the bulk metal. Our objective in this study was to determine the properties and growth characteristics of this nonporous layer under the influence of voltage and concentration of electrolyte.
Author (GRA)

N78-10269# Lockheed-Georgia Co., Marietta.
EFFECTS OF UNDERLOADS ON FATIGUE CRACK GROWTH: DATA TABULATIONS, VOLUME 2 Final Report, 20 Jun. 1975 - 20 Mar. 1977
W. M. McGee and T. M. Hsu Mar. 1977 585 p
(Contract F33615-75-C-3111; AF Proj. 486U)
(AD-A042284; LG77ER0070-Vol-2; AFFDL-TR-77-2-Vol-2) Avail: NTIS HC A25/MF A01 CSCL 11/6

The effects of single overload-underload interaction on constant amplitude crack growth in 2219-T851 aluminum alloy are characterized in terms of delay cycles, affected zone sizes and overload shut-off ratios. Data are presented showing the effects of overload-underload/underload-overload sequences, overload magnitude, underload magnitude, and the constant amplitude maximum and minimum. The effects of hold periods in both tension and compression are also experimentally investigated. Delay cycle data are correlated with predictions from three different crack growth retardation models; namely the generalized Wheeler model, the generalized Willenborg model and the Grumman closure model. For each model, predictions are made using an assumed plastic zone radius and diameter for both plane stress and plane strain conditions and model comparisons are made. Correlations of measured affected zone sizes with the four different assumed plastic zone sizes are also presented. Sensitivities of the generalized Wheeler and generalized Willenborg models to overload shut-off ratio and threshold stress intensity factor are determined. Prediction sensitivity to three different crack growth equations for the 2219-T851 aluminum alloy is also evaluated. Recommendations for future work in development of crack growth retardation models are presented. Author (GRA)

N78-10270# Lockheed-Georgia Co., Marietta.
EFFECTS OF UNDERLOADS ON FATIGUE CRACK GROWTH. VOLUME 1: TECHNICAL SUMMARY Final Report, 20 Jun. 1975 - 20 Mar. 1976
W. M. McGee and T. M. Hsu Mar. 1977 156 p refs
(Contract F33615-75-C-3111; AF Proj. 486U)
(AD-A042658; LG77ER0070-Vol-1; AFFDL-TR-77-2-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 11/6

The effects of single overload-underload interaction on constant amplitude crack growth in 2219-T851 aluminum alloy are characterized in terms of delay cycles, affected zone sizes and overload shut-off ratios. Data are presented showing the effects of overload-underload/underload-overload sequences, overload magnitude, underload magnitude, and the constant amplitude maximum and minimum. The effects of hold periods in both tension and compression are also experimentally investigated. Delay cycle data are correlated with predictions from three different crack growth retardation models; namely the generalized Wheeler model, the generalized Willenborg model and the Grumman closure model. For each model, predictions are made using an assumed plastic zone radius and diameter for both plane stress and plane strain conditions and model comparisons are made. Correlations of measured affected zone sizes with the four different assumed plastic zone sizes are also presented. Sensitivities of the generalized Wheeler and generalized Willenborg models to overload shut-off ratio and threshold stress intensity factor are determined. Prediction sensitivity to three different crack growth equations for the 2219-T851 aluminum alloy is also evaluated. Recommendations for future work in development of crack growth retardation models are presented. Author (GRA)

N78-10271# Watervliet Arsenal, N.Y. Benet Weapons Lab.
DEVELOPMENT OF PROTOTYPE PRODUCTION ESR FACILITIES Final Technical Report
Vito J. Colangelo Jul. 1977 39 p
(AD-A042355; ARLCB-TR-77032) Avail: NTIS HC A03/MF A01 CSCL 13/8

This report describes the procedures employed to produce and develop a technique to manufacture Electroslag Refined Hollows under a contract granted to the Nutek Corp., Washington, Pa. The report describes the approaches taken together with the results obtained for each approach. Drawings and tooling designs are included in the report. Author (GRA)

N78-10272# United States Steel Corp., Monroeville, Pa. Research Lab.
STUDIES OF TEXTURE DEVELOPMENT IN STEEL ARMOR PLATE Final Technical Report, 20 Jan. - 20 Jun. 1977
Hsun Hu Jul. 1977 49 p refs
(Contract DAAG46-77-C-0014; DA Proj. 1T1-62105-AH-84)
(AD-A043343; FTR-76-H-037; AMMRC-CTR-77-19) Avail: NTIS HC A03/MF A01 CSCL 19/4

The present research program consisted of two parts. (1) To produce a number of 6- by 12- by approx. 1/2-inch armor plates having strong (112) - (111) texture with various degrees of intensity by the thermomechanical processing treatments of essentially the same medium-carbon, 5Ni-Si-Cu-Mo-V steels used previously, and to establish the reproducibility of texture, microstructure, hardness, and ballistic performance of these steel armor plates. Results indicated that the reproducibility of the structure and properties of these steel armor plates was excellent. The ballistic limit increased with the texture intensity

in nearly the same manner as observed previously. (2) To explore the possibility of producing a nearly (111) texture with various degrees of intensity in small size specimens cross-rolled at 1500 F to various reductions then quenched, and to establish a procedure for optimizing this texture in larger 6- by 12- by approx. 1/2-inch plates. GRA

N78-10273# North Carolina Univ., Chapel Hill. Dept. of Chemistry.
MAGNETIC AND STRUCTURAL CHARACTERIZATION OF DIBROMO- AND DICHLOROBIS(THIAZOLE)COPPER(II)
William E. Estes, Diane P. Gavel, William E. Hatfield, and Derek J. Hodgson 1 Aug. 1977 58 p refs
(Contract N00014-76-C-0816)
(AD-A043813; TR-3) Avail: NTIS HC A03/MF A01 CSCL 07/3

The temperature dependence of the magnetic susceptibility and the electron paramagnetic resonance spectra of the thiazole complexes dichloro- and dibromobis(thiazole)copper(II) are reported, along with a complete three-dimensional X-ray structure analysis of the dichloro complex based on counter data. The dichloro complex, Cu(C3H3NS)2C12, crystallizes in space group of the monoclinic system with two independent formula units in a cell of dimensions a = 7.332(6), b = 3.853(4), c = 17.493(17) angstrom, and Beta = 93.70(1). The structure has been refined by full-matrix least-squares methods using 1172 independent data to a final value of the conventional R-factor (on F) of 0.028. The structure, which consists of infinite chains of doubly chloride bridged copper(II) ions, is reminiscent of those of the pyridine analogs, with a Cu-Cu separation of 3.853(4) angstrom and bridging angle of 91.89(2). The magnetic data and interchain exchange interactions are discussed in the light of the structural properties of the systems. GRA

N78-10274# Naval Research Lab., Washington, D. C.
ORGANIZATIONAL SCHEME FOR CORROSION-FATIGUE CRACK PROPAGATION DATA Interim Report
J. M. Krafft and W. H. Cullen, Jr. Jul. 1977 99 p refs
(RR0230345; WR0220101)
(AD-A043368; NRL-MR-3505) Avail: NTIS HC A05/MF A01 CSCL 20/11

A model, proposed earlier, is modified in an attempt to explain a number of curious behaviors of corrosion-fatigue crack propagation (CFCP). The behaviors include effects of load ratio R in air and salt water vs. vacuum, and effects of loading frequency at fixed R in these environments. Assumptions of the modelling are reviewed in detail in view of earlier objections to them. The ingredients of CFCP per this model: Poisson contraction, strain hardening, ligament surface attack/annihilation, and stress relaxation are developed and related to conditions of the crack-tip locale. In the modelling, a parameter G, for growth rate factor, is developed solely as a function of the form of the ordinary or of the cyclic stress-strain curve. Previous work had developed a G1 for the ordinary curve, to be associated with the surface attack effect as in stress-corrosion cracking, and one G2 for the cyclic curve to be associated with the stress relaxation effect as in fatigue crack propagation (FCP). A hybrid G2/1 is developed, combining attributes of both, which seems to successfully describe the corrosion induced augmentation of G2. GRA

N78-10275# Naval Research Lab., Washington, D. C.
MATHEMATICAL ANALYSIS OF CIRCULAR CORROSION CELLS HAVING UNEQUAL POLARIZATION PARAMETERS Final Report
E. McCafferty 5 Aug. 1977 49 p refs
(RR0220844)
(AD-A043780; NRL-8107) Avail: NTIS HC A03/MF A01 CSCL 09/1

A theoretical analysis is given for the distribution of electrode potential and current across the surface of coplanar circular galvanic cells in which the polarization parameters of the central anode and disk cathode are unequal. Central features of the model are that the electrostatic potential within the system is given by Laplace's equation and that the polarization curves of both components can be approximated by linear segments over an extended potential range. The potential distribution in a system of unequal anodic and cathodic polarization parameters is not related in a simple manner to the distribution curves for equal parameters. For bulk electrolyte the value of the electrode potential across the surface depends on whether the system is under anodic, cathodic, or mixed control. The current distribution is the more uniform for combinations of more polarizable electrodes. In thin-layer electrolytes there is a geometry effect in which electrode polarization and current flow are concentrated near the anode/cathode juncture. Author (GRA)

N78-10276# California Univ., Berkeley. Lawrence Berkeley Lab.
MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AISI 4340 STEEL MODIFIED WITH ALUMINUM AND SILICON Ph.D. Thesis
M. S. Bhat Feb. 1977 172 p refs
(Contract W-7405-eng-48)
(LBL-6046) Avail: NTIS HC A08/MF A01

The influence of additions of aluminum and combinations of aluminum and silicon to AISI 4340 steels was investigated. The mechanical properties such as strength, fracture toughness (K/sub Ic/), and impact toughness (G/sub v/) were obtained for the modified steels in the quenched and tempered condition. The microstructure was characterized using electron microscopy; the fracture surfaces and inclusion were characterized. The softening of tempered AISI 4340 steel was retarded by additions of aluminum and silicon. The effect of aluminum on the tempering reactions in steel appeared to be similar to that of silicon. The tempered martensite embrittlement phenomenon in AISI 4340 steel occurred at higher tempering temperatures in the presence of silicon and/or aluminum. Significant improvements in the strength and toughness of quenched and tempered 4340 steel were obtained through these additions. An attempt was made to correlate microstructure with the observed mechanical properties. ERA

N78-10277# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
SUBGRAIN REFINEMENT STRENGTHENING Annual Report, 1 Oct. 1975 - 30 Sep. 1976
R. Klundt, C. Schmidt, and O. Sherby 1976 104 p refs
(Contract EY-76-S-03-0326-038)
(SAN-326-38-X6) Avail: NTIS HC A06/MF A01

A subgrain refinement strengthening in ferritic alloys was studied. The alloys were selected from two groups: model alloys and alloys from the LMFBR advanced alloy development program. E-Brite 26-1 was selected as the model ferritic alloy and HT-9 was the advanced alloy selected for evaluation. The E-Brite 26-1 was tested in torsion to very large strains to study the changes occurring in the subgrain size, dislocation density, and subgrain boundary perfection. Compression testing was employed to establish the relationship between strain rate and flow stress. In addition, strain rate change tests were performed in compression to evaluate the stress-strain rate relationship under constant structure conditions. Transmission electron microscopy studies have revealed that a well developed substructure is present in the HT-9 alloy following heat treatment. ERA

N78-10278# Brookhaven National Lab., Upton, N. Y.
CORRELATION OF HIGH AND LOW-CYCLE FATIGUE DATA FOR SOLUTION-TREATED TYPE 304 STAINLESS STEEL
P. Soo and J. G. Y. Chow Dec. 1977 26 p refs
(Contract EY-76-C-02-0016)
(BNL-NUREG-50601) Avail: NTIS HC A03/MF A01

High-cycle fatigue data for solution-treated type 304 stainless steel were generated under load-controlled conditions and compared with available stain-controlled, low-cycle information. It is shown that a good correlation may be obtained if stress-to-strain and strain-to-stress conversions are made with the aid of cyclic stress-strain curves. Using this technique, fatigue curves were obtained between 72 and 1100 F for failures in the range of 100 to 10 to the 8th power cycles. Carbide precipitation, either during test or during pretest thermal aging, will result in an increase in fatigue strength when compared to the solution-annealed state, but the magnitude of the strength increase is likely to be reduced upon continued aging. ERA

N78-10279# Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.

EFFECTS OF HELIUM ON MECHANICAL PROPERTIES OF ARMCO IRON
J. A. Donovan 1976 19 p refs Presented at the Fall TMS-AIME Meeting, Niagara Falls, N. Y., 20-23 Sep. 1976
(Contract E(07-2)-1)
(DP-MS-76-63; Conf-7609106-5) Avail: NTIS HC A02/MF A01

Helium was charged into Armco iron by the decay of dissolved tritium. The effect of helium on the mechanical properties was measured as a function of temperature. Five at. ppm helium degraded the mechanical properties at temperatures greater than 800 K. Intergranular cracks formed in both strained and unstrained portions of the specimen at a temperature of about 1000 K but only in the strained portion at a temperature of about 800 K. High temperature embrittlement is caused by stress-assisted growth of helium bubbles. The maximum in strength caused by dynamic strain aging at 470 K that occurs in steels was absent in Armco iron that contained tritium and helium. ERA

N78-10280# Atomics International, Golden, Colo. Rocky Flats Plant.
NONMETALLIC INCLUSIONS IN JBK-75 STAINLESS STEEL
A. W. Brewer, R. W. Krenzer, J. H. Doyle, and D. H. Riefenberg 14 Mar. 1977 12 p refs
(Contract EY-76-C-04-3533)
(RFP-2536) Avail: NTIS HC A02/MF A01

The microcleanliness of several A-286 and JBK-75 heats that were melted using different techniques were compared. Typical nonmetallic inclusions in each heat were examined optically and with the electron microprobe. The following types of inclusions were found: (1) a titanium carbide-type phase with molybdenum, silicon, and in some cases niobium; (2) a titanium carbide and/or titanium carbonitride Ti(C,N)-type phase; and (3) small sulfide stringers with titanium and trace amounts of carbon. Results are discussed in terms of alternative methods for evaluating the microcleanliness of superalloys. ERA

N78-10281# Sandia Labs., Albuquerque, N. Mex.
DUAL CHARACTERISTICS OF YIELD AND ULTIMATE STRENGTH AS APPLIED TO TWO GRADES OF BERYLLIUM
T. G. Priddy, S. E. Benzley, and R. L. Johnson Feb. 1977 36 p refs
(Contract EY-76-C-04-0789)
(SAND-77-0122) Avail: NTIS HC A03/MF A01

Published yield and ultimate biaxial strength data for two grades of beryllium are correlated with the use of a macroscopic failure model. Cross sections of the resulting surfaces in three dimensional stress space are drawn to illustrate the expected transition from ductile to brittle fracture for triaxial tension states of stress. The usefulness of these models to the prediction of fracture in ductile materials is discussed. ERA

N78-10282# Ames Lab., Iowa.
THERMAL CONDUCTIVITY OF HYDROGEN DOPED HIGH PURITY VANADIUM M.S. Thesis - Iowa State Univ.
Dallas Ray Courtney Mar. 1977 40 p refs
(Contract W-7405-eng-82)
(IS-T-752) Avail: NTIS HC A03/MF A01

The electrical resistivity, thermal conductivity, and Seebeck coefficient of three hydrogen doped high purity vanadium rods were measured during heating from 77 K to 300 K. Correlations were made of the anomalous effects observed in two of the samples with the temperature of transformation from a hydride in a solid solution matrix to a solid solution. An increase in electrical resistivity was observed after thermal cycling but no apparent change in transformation temperature was observed. ERA

N78-10283# Connecticut Univ., Storrs.
ELECTRODE POLARIZATION STUDIES IN HOT CORROSION SYSTEMS Progress Report, 1 Jun. 1976 - 31 May 1977
O. F. Devereux Feb. 1977 59 p
(Contract EY-76-S-02-2960)
(COO-2960-1) Avail: NTIS HC A04/MF A01

A cell suitable for polarizing metals and alloys in molten sodium salts under controlled atmosphere at one atmosphere pressure and 1000 C was constructed and operated. The cell comprises a standard three electrode configuration, with a reference electrode contained in a defect zirconia crucible, reversible to oxide ion. Kinetic atmosphere control on H2, CO, and H2S was maintained, thus fixing all compositional parameters in the gas/liquid two phase system. This system was modelled thermodynamically, yielding complete solution for gas phase composition as a function of external control parameters. Analysis of the liquid phase is in progress. ERA

N78-10284# Case Western Reserve Univ., Cleveland, Ohio.
ELASTIC AND PLASTIC STRAINS AND THE STRESS CORROSION CRACKING OF AUSTENITIC STAINLESS STEELS Progress Report, 30 Arp. - 30 Dec. 1976
A. R. Troiano Feb. 1977 29 p refs
(Contract EY-76-S-02-2576)
(COO-2576-4) Avail: NTIS HC A03/MF A01

The influence of homogeneous (uniaxial tension) and heterogeneous (rolling) deformation on the SCC of a transformable (301) and a nontransformable (310) stainless steel in 30 percent MgCl2 was studied. The amount or type of deformation with or without the presence of deformation induced martensite did not appear to influence the electrochemical parameters such as the rest potential or the critical cracking potential. Metallographic studies combined with failure tests and polarization curves identified the pitting potential with the critical cracking potential and indicated that the cracking potential was merely that for initiation of cathodic protection; that is the potential at which the current changes from anodic to cathodic. The failure time at constant applied stress increased significantly with amount of deformation indicating a maximum or optimum amount of plastic deformation. ERA

N78-10285# Los Alamos Scientific Lab., N. Mex.
STABILITY OF REFRACTORY CASTABLES TO STEAM-N2 AND STEAM-CO ATMOSPHERES
F. D. Gac Sep. 1976 78 p refs
(Contract W-7405-eng-36)
(LA-6508-T) Avail: NTIS HC A05/MF A01

The properties of three refractory castables, designated as high, intermediate, and low Al2O3, were investigated after the castables had been exposed to steam-N2 and steam-CO atmospheres at 199 C and 450 psi for 6,12, and 18 days. General chemical reactions were identified. First, the residual unreacted calcium aluminate cement compounds in the castables reacted with the steam to form additional cementitous material. This reaction was considered primarily responsible for the observed increase in mechanical strength of the castables. Second, a portion of the cement bond in the castables was destroyed by the CO, CO2, and H2O in the test atmospheres, as evidenced by the reaction of CaO to form CaCO3 and Ca(HCO2)2. Third, the free Al2O3 in the castables hydrated to form boehmite. A volume expansion accompanied this reaction. Fourth, a portion of the free SiO2 was removed from the SiO2 containing castables by reacting with the steam. ERA

N78-10286# Oak Ridge National Lab., Tenn.
CORROSION RESISTANCE OF TYPE 316 STAINLESS STEEL TO Li2BeF4
J. R. Keiser, J. H. DeVan, and D. L. Manning Apr. 1977 18 p refs
(Contract W-7405-eng-26)
(ORNL/TM-5782) Avail: NTIS HC A02/MF A01

The corrosion rate of type 316 stainless steel in molten LiF-BeF2(66-34 mole percent) has been measured in a thermal convection loop operating with a maximum temperature of 650 C and a temperature difference of 160 C. The corrosion rate was correlated with the concentration of impurities in the salt and with the fluoride ion oxidation potential as determined by an on-line voltameter. A corrosion rate of ~10 microns/year was observed initially in the as-received salt. This rate decreased as reactions with initial salt impurities went to completion. Direct addition of beryllium metal to the salt further reduced the corrosion rate. ERA

N78-10157*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHARGING CHARACTERISTICS OF MATERIALS: COMPARISON OF EXPERIMENTAL RESULTS WITH SIMPLE ANALYTICAL MODELS
Carolyn K. Purvis, N. John Stevens, and Jon C. Oglebay *In its* Proc. of The Spacecraft Charging Technol. Conf. (date) p 459-486 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 11G

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N78-10287 Illinois Inst. of Tech., Chicago.
INFLUENCE OF COLD WORKING ON PROPERTIES OF GLASSY AMORPHOUS POLYMERS Ph.D. Thesis
Bharatkumar Shantilal Thakkar 1976 273 p
Avail: Univ. Microfilms Order No. 77-13764

The influence of cold working on toughness improvement in glassy amorphous polymers, such as polycarbonate, ABS, PVC, etc., was studied. Cold working processes, namely rolling (6 in. diameter rolls), Steckel rolling (1/2 and 1 in. diameter rolls) and drawing (die angle as a parameter), were used to produce thickness reduction up to about 40 percent in flat strip specimens. The Izod impact strength, tensile properties, hardness, density, and the energy absorbed in three point bend tests for notched specimens were measured as a function of strip thickness reduction and process parameters. It was shown that the toughness enhancement in cold working was due to the residual stress state present in the cold worked polymer, as well as the degree of molecular orientation. Dissert. Abstr.

N78-10288 Brown Univ., Providence, R. I.
DYNAMIC MECHANICAL RESPONSE OF SOME POLYMERS Ph.D. Thesis
Shan Shih 1976 152 p
Avail: Univ. Microfilms Order No. 77-14189

An experimental technique for the observation of mechanical pulses propagating along stretched filaments of rubber, polyethylene, and nylon is described. The pulses were produced either by suddenly volatilizing a piece of piano wire, which was used to maintain the additional stretch of the specimen, or by firing a gas gun against a small clamp on the prestretched specimen. The particle velocity of the specimen was measured by a magnetic transducer. This technique affords an extremely convenient method for studying the propagation of mechanical pulses and observing the formation and decay of shock waves. Dissert. Abstr.

N78-10289 California Univ., Davis.
THE EFFECT OF WEATHERING ON THE ENGINEERING BEHAVIOR OF PLASTIC FILMS Ph.D. Thesis
William Howard Kimball 1976 75 p
Avail: Univ. Microfilms Order No. 77-13968

An investigation of the engineering performance of three plastic film materials in weathered and semiweathered conditions was made. The materials were high impact polystyrene (HIP), polyethylene terephthalate (PET) and polyvinyl chloride (PVC). Three areas of performance were studied: (1) water vapor diffusion behavior; (2) tensile properties as a function of temperature; and (3) strain rate and the optical transmission as a function of wavelength in the visible spectrum. The study was made to determine the suitability of the materials in solar energy designs. Significant changes were found in all three materials in water vapor diffusivity and permeability values, as well as, in the activation energies for these processes. Dissert. Abstr.

N78-10290# Polish Academy of Sciences, Warsaw.
ANALYSIS OF GAS-TIGHT ADHESIVES FOR GLUING CERAMIC METALS [ANALIZA KLEJOW GAZOSZCZELNYCH DO KLEJENIA SPIEKOW CERAMICZNYCH]
Henryk Staniak, S. Donkow, K. A. Kunert, and J. Ranachowski 22 Mar. 1977 14 p refs In POLISH
Avail: Issuing Activity

An analysis of the fitness of glues from individual groups of polymers is provided. The following polymer groups are discussed: (1) glues based on cellulose derivatives; (2) chloroprene glues; (3) cyanoacryl glues; (4) polyurethane glues; (5) phenol-formaldehyde glues; and (6) epoxide glues. Plasticized epoxide resins are also discussed, along with the subject of preparing materials for gluing. Author

N78-10291*# Owens-Illinois, Inc., Toledo, Ohio.
IMPROVED CERAMIC HEAT EXCHANGE MATERIAL Interim Report
H. L. McCollister Sep. 1977 40 p
(Contracts NAS3-19733; EC-77-A-31-1011)
(NASA-CR-135262; CONS/733-1) Avail: NTIS HC A03/MF A01 CSCL 11B

Improved corrosion resistant ceramic materials that are suitable for use as regenerative heat exchangers for vehicular gas turbines is reported. Two glass-ceramic materials, C-144 and C-145, have superior durability towards sulfuric acid and sodium sulfate compared to lithium aluminosilicate (LAS) Corning heat exchange material 9455. Material C-144 is a leached LAS material whose major crystalline phase is silica keatite plus mullite, and C-145 is a LAS keatite solid solution (S.S.) material. In comparison to material 9455, material C-144 is two orders of magnitude better in dimensional stability to sulfuric acid at 300 C, and one order of magnitude better in stability to sodium sulfate at 1000 C. Material C-145 is initially two times better in stability to sulfuric acid, and about one order of magnitude better in stability to sodium sulfate. Both C-144 and C-145 have less than 300 ppm delta L/L thermal expansion from ambient to 1000 C, and good dimensional stability of less than approximately 100 ppm delta L/L after exposure to 1000 C for 100 hours. The glass-ceramic fabrication process produced a hexagonal honeycomb matrix having an 85% open frontal area, 50 micrometer wall thickness, and less than 5% porosity. Author

N78-10292*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREPARATION OF HETEROCYCLIC BLOCK COPOLYMER FROM PERFLUOROALKYLENE OXIDE ALPHA, OMEGA-DIAMIDOXIMES Patent Application
Robert W. Rosser, Leonard O. Ross (Stanford Research Inst., Menlo Park, Calif.), and Mark Iannone, inventors (to NASA) Filed 17 Oct. 1977 21 p
(NASA-Case-ARC-11060-1; US-Patent-Appl-SN-843090) Avail: NTIS HC A02/MF A01 CSCL 07C

New heat and chemical resistant polymeric materials are prepared by the thermal condensation of diamidoxime monomers to yield larger molecules having 1, 2, 4-oxadiazole linkages. This process of direct intermolecular condensation of amidoxime groups is used for the synthesis of new fluorinated 1, 3, 4,-oxadiazole polymers. NASA

N78-10293*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
LARGE-SIZE MONODISPERSE LATEXES AS A COMMERCIAL SPACE PRODUCT
Dale M. Kornfeld Aug. 1977 50 p refs
(NASA-TM-78132) Avail: NTIS HC A03/MF A01 CSCL 11J

Proposed spacelab production of large-size (2-40 micron diameter) monodispersed latexes is discussed. Explanations are given for the present lack of monodisperse particles in this size range. The four main topics discussed are: (1) the potential uses of these large particle size latexes, (2) why it is necessary for the particles to have a very narrow size distribution, (3) why large amounts of these monodisperse latexes are needed, and (4) why it is necessary to go to microgravity to prepare these latexes. Author

N78-10294*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPROVED PERFORMANCE OF SILICON NITRIDE-BASED HIGH TEMPERATURE CERAMICS
Richard L. Ashbrook 1977 26 p refs Presented at Mater. Show and Conf., Chicago, 25-27 Oct. 1977; sponsored by ASM
(NASA-TM-73719; E-9268) Avail: NTIS HC A03/MF A01 CSCL 11B

Recent progress in the production of Si3N4 based ceramics is reviewed: (1) high temperature strength and toughness of hot pressed Si3N4 were improved by using high purity powder and a stabilized ZrO2 additive, (2) impact resistance of hot pressed Si3N4 was increased by the use of a crushable energy absorbing layer, (3) the oxidation resistance and strength of reaction sintered Si3N4 were increased by impregnating reaction sintered silicon nitride with solutions that oxidize to Al2O3 or ZrO2, (4) beta prime SiA1ON compositions and sintering aids were developed for improved oxidation resistance or improved high temperature strength. Author

N78-10295*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF SINGLE-CRYSTAL AND POLY-CRYSTALLINE MAGANESE-ZINC FERRITE IN CONTACT WITH VARIOUS METALS
Kazuhisa Miyoshi (Kanazawa Univ.) and Donald H. Buckley 1977 28 p refs
(NASA-TP-1059) Avail: NTIS HC A03/MF A01 CSCL 20B

Sliding friction experiments were conducted with single-crystal (SCF) and hot-pressed polycrystalline (HPF) manganese-zinc ferrite in contact with various metals. Results indicate that the coefficients of friction for SCF and HPF are related to the relative chemical activity of those metals in high vacuum. The more active the metal, the higher the coefficient of friction. The coefficients of friction for both SCF and HPF were the same and much higher in vacuum than in argon at atmospheric pressure. All the metals tested transferred to the surface of both SCF and HPF in sliding. Both SCF and HPF exhibited cracking and fracture with sliding. Cracking in SCF is dependent on crystallographic characteristics. In HPF, cracking depends on the orientation of the individual crystallites. Author

N78-10296# Pennsylvania Univ., Philadelphia. Dept. of Chemistry.
TRANSPORT AND OPTICAL PROPERTIES OF POLYTHIAZYL BROMIDES
C. K. Chiang, Marshall J. Cohen, Dale L. Peebles, A. J. Heeger, and M. Akhtar 26 Jul. 1977 35 p refs
(Contract N00014-75-C-0962; Grant NSF DMR-76-00678)
(AD-A042373; TR-77-4) Avail: NTIS HC A03/MF A01 CSCL 07/2

Polymeric sulfur nitride, polythiazyl, (SN)x, has been of interest in recent years as the first example of a covalent polymer which is a metal. Studies of the optical and electronic properties have indicated metallic behavior along the (SN)x chains with sufficient interchain coupling to give the properties of an anisotropic three dimensional metal. As part of a continuing study of the properties of (SN)x we have been investigating its reactions with halogens. In 1969 Patton made brief reference to the fact that (SN)x reacts with chlorine to give NSCl. Bernard et al. have reported recently that (SN)x reacts with bromine vapor at room temperature to give a gray-blue solid the composition of which was not determined. Independent studies carried out by us and by Street et al. involved the characterization of crystals and films of (SNBr0.4)x, the first derivative of (SN)x. In this paper we report the initial results of studies of the electrical transport and optical properties of (SNBr0.4)x and the related derivative (SNBr0.25)x. GRA

N78-10297# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
DEUTERATED FLUIDS - DEUTERATED SYNTHETIC HYDROCARBON FLUID AND GREASE Final Report
Alfeo A. Conte, Jr. and Neal D. Rebuck 1 Mar. 1977 23 p refs
(AD-A042618; NADC-77027-30) Avail: NTIS HC A02/MF A01 CSCL 11/8

The replacement of hydrogen atoms with deuterium atoms in a synthetic hydrocarbon lubricant has been shown to substantially improve its oxidation resistance via the deuterium isotope effect. In addition, it was determined that the anti-friction bearing performance life of a MIL-G-81322 grease, formulated with the deuterium substituted fluid, increased significantly at 400 F (478 K). The results of this investigation are presented in this final report along with recommendations for the utilization of the deuterium isotope effect in developing a super clean instrument bearing grease. Author (GRA)

N78-10298# Stanford Univ., Calif. Dept. of Chemistry.
THE STRUCTURE AND PROPERTIES OF POLYMERIC MATERIALS Final Report, 15 Aug. 1972 - 31 Jan. 1977
Paul J. Flory 31 Jan. 1977 14 p refs
(Grant AF-AFOSR-2441-73)
(AD-A042643; AFOSR-77-0841TR) Avail: NTIS HC A02/MF A01 CSCL 11/10

A total of thirty-five publications have been generated from this research appearing in thirteen primary journals. The connection between two traditional theoretical approaches to the treatment of rubber elasticity has been bridged. One of these is the theory of 'phantom' networks, developed originally by James and Guth, in which the integrity of the chains is ignored and the junctions (cross linkages) are allowed to seek their preferred positions without regard for the entanglements of chains that severely limit configurational rearrangements in real systems. The other follows the precepts of W. Kuhn, elaborated by Wall, Treloar, Flory and Rehner and others, according to which the cross linkages are firmly embedded in their surroundings and hence must undergo ('affine') displacements in proportion to the macroscopic strain. This research suggests that the unswollen network at small deformations conforms approximately to the affine behavior, but that it approaches the phantom model at high elongations and/or high degrees of swelling. Decreases with strain and dilution may account for departures from the theoretical relationship. The theory of order-disorder in systems of rigid extended polymer chains and of phase equilibria in such systems (Proc. Roy. Soc. London, A234, 73 (1956) has been adapted without difficulty to semiflexible chains consisting of rigid rod-like segments connected by flexible joints. Author (GRA)

N78-10299# National Bureau of Standards, Washington, D. C. Polymers Div.
PYROELECTRICITY AND CHARGE TRANSPORT IN A COPOLYMER OF VINYLIDENE FLUORIDE AND TETRA-FLUOROETHYLENE
M. G. Broadhurst, G. T. Davis, S. C. Roth, and R. E. Collins 1 Jul. 1977 20 p refs
(Contract N00014-77-F-0007)
(AD-A043374) Avail: NTIS HC A02/MF A01 CSCL 20/3

A copolymer of 73 weight percent vinylidene fluoride and 27 weight percent tetrafluoroethylene can be made piezoelectric and pyroelectric by the temporary application of high electric fields. The application of a thermal pulse technique to the active films reveals that they are polarized preferentially near the positive electrode and that the polarization extrudes further into the film as the poling temperature is increased. These observations can be made consistent with earlier data which show the piezoelectric and pyroelectric coefficient to be independent of poling temperature by proposing charge transfer through the unpoled region of the polymer. Transient charge flow following a step-increase in temperature and pyroelectric response from layered structures support this explanation. GRA

N78-10300# Sandia Labs., Albuquerque, N. Mex.
CASTABLE THERMOPLASTIC URETHANE ELASTOMERS. 2: STRUCTURE PROPERTY CORRELATIONS
R. R. Lagasse and K. B. Wischmann 1977 12 p refs Presented at the 173d Natl. Meeting of the Am. Chem. Soc., New Orleans, 20 Mar. 1977
(Contract EY-76-C-04-0789)
(SAND-76-9052; Conf-770301-11) Avail: NTIS HC A02/MF A01

Macromolecular morphology was correlated with both high strain ultimate and low strain dynamic mechanical properties of thermoplastic elastomers. Although the morphology-property correlations are shown to fit within the general framework of a domain model, the possibility is raised that the liquid casting procedure might give rise to slightly different structural features than the more conventional fabrication methods (e.g., melt processing). ERA

N78-10301# Addis Translations International, Portola Valley, Calif.
FUNDAMENTAL STUDIES ON THE NEW OPTICAL GLAS-

SES. 2: ON THE FLUORIDE GLASSES
T. Izumitani and R. Terai Feb. 1977 9 p refs Transl. into ENGLISH from Osaka Kogyo Gijutsu Shikensho Kiho, vol. 3, no. 1, Jan. 1952 p 25-27 Sponsored by ERDA
(UCRL-Trans-11216) Avail: NTIS HC A02/MF A01

Beryllium fluoride glass was perfected by including a high percentage of PbF2. The weathering resistance of fluoride glasses was improved by using suitable amounts of TiO2 or ZrF4-2KF. Even after boiling for prolonged periods, the rate of corrosion was less than in those containing oxides. Fluoride glasses have a remarkably low softening point. The activation energy of the electric conductivity of the fluoride glasses is greater than that of glasses containing oxides. A new type of optical glass with refractive index = 1.6874, dispersive power = 27.4 was obtained. ERA

N78-10302# California Univ., Berkeley. Lawrence Berkeley Lab.
INFLUENCE OF POROSITY ON THE MECHANICAL PROPERTIES OF LEAD ZIRCONATE-TITANATE CERAMICS Ph.D. Thesis
Dipak Ranjan Biswas Sep. 1976 62 p refs
(Contract W-7405-eng-48)
(LBL-5479) Avail: NTIS HC A04/MF A01

Niobium doped lead zirconate-titanate (PNZT) was used to investigate the effect of porosity on the mechanical properties of a polycrystalline ceramic. Spherical and acicular pores (25 to 150 microns) were introduced by using organic materials and the grain size (2 to 5 microns) was constant throughout the study. The effect of porosity on the fracture strength was predicted quite well by Weibull's probabilistic approach. The elastic modulus showed a linear relationship with increase in porosity (110 to 150 microns) and showed a higher value for PNZT-fine pore (2 to 3 microns) ceramics at same volume percent porosity. A decrease in fracture toughness with increase in porosity (110 to 150 microns) was also observed. Fine pores in PNZT polycrystalline ceramic gave higher strength, elastic modulus and fracture toughness compared to the PNZT-large pore ceramics at equivalent porosites. Fracture surface analysis by scanning electron microscopy showed that the fracture origin was at the tensile surface, at the edges of the specimen and just underneath the tensile surface. ERA

N78-10303# California Univ., Berkeley. Lawrence Berkeley Lab.
DEFECTS, PHASE TRANSFORMATIONS AND MAGNETIC PROPERTIES OF LITHIUM FERRITE Ph.D. Thesis
Raja Kishore Mishra Mar. 1977 121 p refs
(Contract W-7405-eng-48)
(LBL-5759) Avail: NTIS HC A06/MF A01

The achievement of suitable magnetic properties in ceramic ferrites through thermomechanical treatments rather than through varying the processing and fabrication parameters alone was investigated using ferrimagnetic lithium ferrite and some other spinel structure materials. Topics discussed include: crystal structure; phase decomposition, material loss and surface energy; lattice defects; and electrical resistivity and magnetic hysteresis. ERA

N78-10304# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
SPECIFICATION FOR THE APPLICATION OF CHEMGLAZE Z306 BLACK PAINT UTILISING PYROLAC P123 AS PRIMER
Paris ESA May 1977 16 p
(ESA-PSS-31/QRM-25P-Issue-1) Avail: NTIS HC A02/MF A01

The requirements for producing a low-outgassing matt black coating on spacecraft utilizing Chemglaze Z306 polyurethane paint on Pyrolac P123 primer are specified. Chemglaze Z306 is a polyurethane paint curing by reaction with the water vapor present in air; it is produced by Hughson Chemical Corporation USA. Pyrolac P123 is a three part epoxy primer produced by Astral Peintures et Vernis, Paris, France. ESA

N78-10165*# IIT Research Inst., Chicago, Ill.
ELECTRICALLY CONDUCTIVE PAINTS FOR SATELLITES
J. E. Gilligan, R. E. Wolf (Desota, Inc.), and C. Ray (Desota, Inc.) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 593-611 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 11G

N78-10166*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FORMULATION OF ELECTRICALLY CONDUCTIVE, THERMAL-CONTROL COATINGS
Michael C. Shai *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 613-620 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 11G

N78-10167*# General Electric Co., Philadelphia, Pa. Space Div.
MATERIALS AND TECHNIQUES FOR SPACECRAFT STATIC CHARGE CONTROL
L. J. Amore and A. E. Eagles *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 621-654 refs (For availability see N78-10129 01-12)
(Contracts F33615-76-C-5075; F33615-76-C-5258)
Avail: NTIS HC A99/MF A01 CSCL 11G

N78-10168*# General Electric Co., Philadelphia, Pa. Space Div.
SECONDARY EMISSION CONDUCTIVITY OF HIGH PURITY SILICA FABRIC
V. J. Belanger and A. E. Eagles *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 655-686 refs (For availability see N78-10129 01-12)
(Contract F33615-C-75-5267)
Avail: NTIS HC A99/MF A01 CSCL 11G

N78-10169*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INVESTIGATION OF CONDUCTIVE THERMAL CONTROL COATINGS BY A CONTACTLESS METHOD IN VACUO
W. Viehmann, C. M. Shai, and E. L. Sanford *In its* Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 687-698 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 11G

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N78-10305 Materials Research Labs., Melbourne (Australia).
USE OF THE MARKHAM SEMI-MICRO STILL FOR THE DETERMINATION OF STABILISERS IN PROPELLANTS. PART 1: DETERMINATION OF ETHYL CENTRALITE AT THE 3-8% LEVEL
R. G. Davidson May 1977 13 p refs
(MRL-TN-401-Pt-1; AR-000-654-Pt-1) Copyright. Avail: Issuing Activity

This new procedure gave results which compared well with those from the traditional steam distillation-gravimetric method, so that continuity could be assured for propellants undergoing extended accelerated thermal aging. A determination could be completed within thirty minutes by the new method, compared with 24 hours by the existing method. The apparatus was more compact, and smaller amounts of sample and reagents were required. The ethyl centralite was determined by direct spectrophotometry of the steam distillate, thus eliminating solvent extraction and subsequent chemical operations involved in the gravimetric method. Author

N78-10306*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE LIQUID HYDROGEN OPTION FOR THE SUBSONIC TRANSPORT: A STATUS REPORT
Peter F. Korycinski Sep. 1977 28 p refs Presented at 12th

Intersoc. Energy Conversion Eng. Conf., Washington, D. C., 28 Aug. - 2 Sep. 1977
(NASA-TM-74089) Avail: NTIS HC A03/MF A01 CSCL 21D

Continued subsonic air transport design studies include the option for a liquid hydrogen fuel system as an aircraft fuel conservation measure. Elements of this option discussed include: (1) economical production of hydrogen; (2) efficient liquefaction of hydrogen; (3) materials for long service life LH2 fuel tanks; (4) insulation materials; (5) LH2 fuel service and installations at major air terminals; (6) assessment of LH2 hazards; and (7) the engineering definition of an LH2 fuel system for a large subsonic passenger air transport. Author

N78-10307# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
A LATTICE DYNAMICAL MODEL OF THERMAL INITIATION OF SOLID EXPLOSIVES
F. J. Owens Aug. 1977 24 p refs
(AD-A043647; ARLCD-TR-77041) Avail: NTIS HC A02/MF A01 CSCL 19/1

It is proposed that the thermal initiation of a solid explosive results from a chemical reaction between the ions of the lattice induced by large amplitude vibrations of the ions at the initiation temperature. Such vibrations would allow the ions of the lattice to approach each other enabling chemical reaction to occur. The large amplitude vibrations are possible in a solid in which lattice potentials are softer and more anharmonic. Reaction rates for this mechanism are formulated in terms of the force constants of the normal modes of vibration for the case of a simple cubic solid. Comparison of available lattice dynamical data, such as neutron diffraction and Raman studies for the isostructural pair KN3 and TLN3, the latter of which is unstable, support the possibility of softer and more anharmonic potentials in explosive solids. Author (GRA)

N78-10308# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
A REVIEW OF DIESEL FUEL DETERIORATION AND RELATED PROBLEMS
Leo L. Stavinoha and Maurice E. LePera May 1977 33 p refs
(Contract DAAG53-76-C-0003)
(AD-A043566; AFLRL-88) Avail: NTIS HC A03/MF A01 CSCL 21/4

This report represents in essence an 'overview' presented by the authors at a seminar sponsored by the U.S. Army Research Office (ARO) in April 1977 to promote basic research in the area of 'Diesel Fuel Stability'. This report provides a review of the general topic of fuel deterioration with primary emphasis on diesel or distillate fuels used in compression ignition engines which power the majority of Army tactical and combat vehicles. Selected field problems regarding fuel stability and related problems are presented and the status of on-going research and development programs are outlined. This information has been prepared to place in perspective the background and field problems which have prompted current research activities to detect, predict, and prevent fuel stability associated equipment failures. A selected bibliography used as the basis for the review portion of this report and as a source for additional fuel stability information has been provided. Author (GRA)

N78-10309# Ogden Air Logistics Center, Hill AFB, Utah. Utah Propellant Lab Section.
PROPELLANT SURVEILLANCE REPORT MINUTEMAN 3 STAGE 3
Elizabeth M. Dalaba Jul. 1977 241 p
(AD-A043656; MANCP-374(77)) Avail: NTIS MF A01 CSCL 21/9

This report contains test results from testing of Minuteman III, Stage III propellant manufactured by Aerojet Solid Propulsion Company and Thiokol Corporation, Wasatch Division. These results are compared statistically with propellants of similar ages from Minuteman II Stage II. Regressions are given for only statistically significant parameters from very low rate tensile, high rate biaxial tensile under pressure, stress relaxation and thermal coefficient of liner expansion tests. There are some significant regressions in each of these tests. Case liner bonds also show significant changes which are potentially life limiting. Significant changes in other parameters may be the result of limited testing, both in numbers and ages. Analysis of covariance for test data from lined and unlined cartons of Stage II and Stage III propellant and for the four tests listed above are given in the statistical appendix. Author (GRA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N78-10310 Carnegie-Mellon Univ., Pittsburgh, Pa.
INVESTIGATION OF THE FRACTURE MECHANISM IN Ti-5Al-2.5Sn AT CRYOGENIC TEMPERATURES Ph.D. Thesis
Robert Hugh VanStone 1977 346 p
Avail: Univ. Microfilms Order No. 77-13845

Fractography and metallographic sectioning were used to investigate the influence of microstructure on the fracture mechanism and fracture toughness of normal interstitial and extra low interstitial (EL) plates of Ti-5Al-2.5Sn at cryogenic temperatures. Plates of each grade were mill annealed at 815 C followed by either air or furnace cooling. The lower iron content of the ELI alloys resulted in smaller sizes and volume fraction of the iron-stabilized beta phase. The slower cooling rate of furnace cooled plates of both grades caused an ordering phase transformation. At 20 K and 77 K, the ELI alloys were tougher than the normal interstitial plates. It is shown that the void nucleation rates are decreased and fracture toughness increased by reducing the localized strain concentrations at blocked slip bands and twins. This is accomplished by lowering interstitial contents and by cooling Ti-5Al-2.5Sn rapidly from the annealing temperature so as to avoid odering. Dissert. Abstr.

N78-10311 Polish Academy of Sciences, Warsaw.
ULTRASONIC METHODS OF STUDYING THE PROPERTIES OF SETTING CEMENT [ULTRADZWIEKOWA METODA BADANIA WLASNOSCI WIAZACYCH CEMENTOW]
Ewa Drescher 2 Mar. 1977 19 p refs In POLISH
Avail: Issuing Activity

The literature of cement chemistry is reviewed, giving current theories of the process of setting and especially the early stages of solidification. Against the backdrop of these theories, ultrasonic observation of the early stages of setting stands out because it makes it possible to follow the course of hydration without interference in the setting process. Most authors do not deny that in the early stages of cement slurry hydration, a gel forms. The gelling process creates amorphous forms and agglomerations of these forms, whose structure can be destroyed during studies which require the taking and thermic or mechanical processing of a sample. Ultrasonic studies of the changes of speed and attenuation of acoustic waves of varying length conducted as a function of the slurry solidification time provide information on changes taking place in the structure of cement slurries during the setting process. Observed changes of measured parameters of propagation are correlated with changes in the structure of cement slurries occurring in the early stages of setting. Author

N78-10312# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
SHORT TERM COURSE ON NUMERICAL ANALYSIS OF PLATES AND SHELLS
Tarun Kant, ed. 28 May 1977 502 p refs Lecture notes presented at Bombay, 9-28 May 1977
Avail: NTIS HC A22/MF A01

Lecture notes for a computer-oriented course in stress analysis are presented. The theoretical foundations, viz. the classical and higher-order theories of plates and shells for static, dynamic, and stability analyses, are reviewed, followed by in-depth treatment of the three important numerical techniques - finite difference, numerical integration and the finite element method and their applications to plates and shells. For individual titles, see N78-10313 through N78-10325.

N78-10313# Indian Inst. of Tech., Bombay. Dept. of Mathematics.

BASIC ELECTRICITY **c39**
B. S. Ramachandra Rao *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 15 p (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

The position vector of a point P is given as a function of scale vectors and parameters related to the cartesian coordinates of P. Strain components and stress-strain relations in the linear theory of elasticity are derived. The equation of equilibrium in orthogonal curvilinear coordinate systems is given and Naviers equations are discussed. J.H.

N78-10314# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
THIN PLATE THEORY **c39**
V. D. Dixit *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 7 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

Study of plates subjected to transverse loads is generally classified under three sub-heads depending on the relative magnitudes of two parameters, say R1 and R2, where: R1 = a typical span dimension of the plate/thickness of plate and R2 = maximum deflection in the plate/thickness of plate. Governing differential equations, for thin plates with small deflections, namely when R1 is less than 10 and R2 is less than 0.2, are briefly reviewed. Author

N78-10315# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
THIN SHELL THEORY **c39**
R. S. Ayyar *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 22 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

The history of thin shell theory is recounted and basic relationships are derived such as shell coordinates, strain-displacement relations, stress resultants and stress couples, and equations describing equilibrium and boundary conditions. J.H.

N78-10316# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
HIGHER ORDER PLATE AND SHELL THEORIES **c39**
Tarun Kant *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 33 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

The derivation of a higher-order shell theory is presented using the following assumptions: (1) the square of the ratio of the thickness to the minimum radius of curvature is neglected compared to unity, (2) deflections and strains are small, (3) shell is made-up of layers of orthotropic material with the material's planes of symmetry coincident with the shell reference frame, (4) stresses are replaced by stress-resultants, (5) the points on a line normal to the reference surface, before deformation, need not even remain on a straight line after deformation. Author

N78-10317# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
STABILITY OF PLATES AND SHELLS **c39**
S. Chatterjee *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 54 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

Static and dynamic criteria of stability are defined as well as stable and unstable critical equilibria; the concept of snap-through buckling is reviewed. The stability properties of thin plates and thin cylindrical shells are then discussed. J.H.

N78-10318# Indian Inst. of Tech., Bombay. Dept. of Mathematics.
DYNAMICS OF PLATES AND SHELLS **c39**
C. K. Ramesh *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 15 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

Principles of classical dynamics are reviewed and equations describing the dynamics of plates and shells are then derived. J.H.

N78-10319# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
INTRODUCTION TO NUMERICAL SOLUTION TECHNIQUES **c64**
Tarun Kant *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 7 p ref (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

A gap is bridged between theory and programming in modern stress analyses. Numerical programming techniques are outlined since program efficiency depends on the techniques employed. The finite difference method, numerical integration method, and finite element method were studied in terms of stress analysis. Classification of plate/shell problems was examined according to the type of response to be calculated and the configuration. Author

N78-10320# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
FINITE DIFFERENCE TECHNIQUE **c64**
D. N. Buragohain, V. D. Dixit, and Tarun Kant *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 46 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A03/MF A01

Plate and shell problems involving partial differential equations were studied. Derivatives of a function were represented by the difference expressions at finite intervals. At each pivotal point of the intervals, an equation expressing the differential equation by finite difference was written. Together with the boundary conditions, a set of simultaneous equations was established to solve numerically the function at the pivotal points. Author

N78-10321# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
NUMERICAL INTEGRATION TECHNIQUE **c64**
Tarun Kant *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 44 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

Means of solving differential equations, which contain a single independent variable, through numerical integration techniques are studied. Initial value and boundary value problems are considered along with one step and multi-step methods of solving them. Euler's algorithm is outlined, as are the Runge-Kutta and the Milne method. B.L.P.

N78-10322# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
FINITE ELEMENT TECHNIQUE **c64**
K. S. R. K. Prasad *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 206 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

Finite element techniques for analysis of complex structural components are reviewed. A number of methods are mentioned which facilitate accurate analysis of a wide spectrum of structural problems. These methods are examined and the basis of their formulations is discussed in order to identify each one's place among the other approximate continuum as well as discrete and numerical methods. Author

N78-10323# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
A DISPLACEMENT METHOD OF ANALYSIS FOR FOLDED PLATES **c64**
N. K. Bairagi *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 21 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

The method of displacements based on the equivalent substitute folded plate system of prismatic shells is described. This method is useful as an approximation for use with shells with a surface discontinuity, openings or stiffening ribs. It can be successfully extended beyond the elastic range for predicting

of the redistributed stress resultants at each stage of loading until collapse and can be solved by hand computation. Author

N78-10324# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
AN APPROXIMATE SOLUTION FOR CONTINUOUS PLATES **c39**
K. Rataiah *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 13 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

A Levy type solution for tackling continuous plates on skew supports is presented. This approximate solution technique is especially useful in dealing with floor slabs in buildings or bridge decks which are supported by exterior walls and often have intermediate supports in the form of beams and partitions or in the form of columns. A least squares collocation method is discussed along with boundary error equations and deflection functions. Author

N78-10325# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
AN APPROXIMATE SOLUTION FOR POINT-SUPPORTED PLATES **c39**
K. Rajaiah *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 5 p (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

Structural plates supported at discrete points at corners or at a few discrete locations on or close to the periphery are considered. A computationally and analytically difficult boundary value problem is provided by the free edge conditions and the singularities at the supports. Methods of analysis are reviewed making use of the deflection function. Author

N78-10326*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
THERMAL COMPENSATOR FOR CLOSED-CYCLE HELIUM REFRIGERATOR Patent Application
Donald E. Jennings (NAS-NRC) and John J. Hillman, inventors (to NASA) Filed 30 Sep. 1977 17 p
(NASA-Case-GSC-12168-1; US-Patent-Appl-SN-838337) Avail: NTIS HC A02/MF A01 CSCL 13A

The wave length of an infrared, semiconductor laser diode is maintained substantially constant by maintaining the diode temperature constant. The diode is carried by a cold tip of a closed cycle helium refrigerator. The refrigerator has a tendency to cause the temperature of the cold tip to oscillate. A heater diode and a sensor diode are placed on a thermal heat sink so that the sensing diode and substantially the same temperature as the heater diode and substantially no thermal lag exists between them. The sensor diode is connected in a negative feedback circuit with the heater diode so that the tendency of the laser diode to thermally oscillate is virtually eliminated. NASA

N78-10327# Willis (W. P.), Dallas, Tex.
STUDY OF NIGHTTIME PAVEMENT CONSTRUCTION PRACTICES: ASPHALTIC CONCRETE Final Report
W. P. Wills Dec. 1976 84 p Sponsored by FAA
(AD-A041265/0; FAA-RD-76-221) Avail: NTIS HC A05/MF A01 CSCL 13/2

The magnitude of scheduled airline operations at civil airports has made it imperative that runway repair and overlay with hot mix asphaltic concrete be accomplished at night so as not to interfere with normal airline flight schedules. Technical data and recommended construction practices such as working hours, construction lighting, automatic grade control, standby equipment, compaction, construction of transition and other related items are discussed in this study. Experiences of nighttime overlay construction at seven municipal airports are documented in Appendix C. Author

N78-10328# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
PROCEDURES FOR DEVELOPMENT OF CBR DESIGN CURVES Final Report
A. Taboza Pereira Jun. 1977 94 p refs Revised
(DA Proj. 4A7-62719-AT-40)
(AD-A043447; WES-Instruction-S-77-1) Avail: NTIS HC A05/MF A01 CSCL 13/2

The pattern of design relations for flexible pavements was established and reported in WES Instruction Report 4. This pattern has been modified in recent years and new relations established. This report presents the current procedures for determining flexible pavement thickness requirements. The CBR-thickness relationship can be portrayed by an equation or by a combined CBR curve. This report shows how, by use of equivalent single-wheel loads, the single-wheel design criteria can be applied to any multiple-wheel configuration. Means are also presented for developing either single-wheel or multiple-wheel design criteria for various levels of usage based on load repetitions. A detailed example demonstrating equivalent single-wheel load determinations, pass-per-coverage relationships, and thickness requirements is presented. Author (GRA)

N78-10329# Naval Postgraduate School, Monterey, Calif.
INVESTIGATION OF A LINEAR, TWO-DEGREE-OF-FREEDOM SIMULATION OF THE XR-3 CAPTURED AIR BUBBLE (CAB) CRAFT IN THE FREQUENCY DOMAIN M.S. Thesis
Lewis Frank McIntyre Jun. 1977 188 p refs
(AD-A044325) Avail: NTIS HC A09/MF A01 CSCL 01/3

A simplified two-degree-of-freedom simulation in heave and pitch of the XR-3 Captured Air Bubble (CAB) testcraft is developed first in a non-linear form and is subsequently linearized about the steady-state operating point. The model is validated against the six-degree-of-freedom XR-3 Loads and Motions program in the time domain; the linear system is then transformed into the frequency domain by complex matrix inversion. A comparison is made between the linear system frequency response predicted by the two-degree-of-freedom model and that of the Loads and Motions program, as well as actual testcraft data, reduced to the frequency domain by a Fast Fourier Transform (FFT) technique. This comparison of frequency response curves highlights a non-linear mode of CAB craft behavior of possible interest to habitability and seaworthiness studies. Author (GRA)

N78-10330# Naval Intelligence Support Center, Washington, D. C. Translation Div.
THE EFFECT OF TRANSLATIONAL VELOCITY ON THE AERODYNAMIC CHARACTERISTICS OF AN AIR CUSHION VEHICLE
L. F. Kalitiyevskiy 25 Jul. 1977 10 p refs Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 17, 1970 p 4-9
(AD-A044294; NISC-Trans-3946) Avail: NTIS HC A02/MF A01 CSCL 01/3

The effect of translational velocity on the aerodynamic characteristics of a nozzle type air cushion vehicle is investigated in this article. As before, the jet flowing out of the nozzle of the ACV is assumed to be nonviscous, incompressible and quite thin. A plane-circularly shaped nozzle with zero deflection and a certain angle gamma sub c greater than zero is examined. GRA

N78-10331# Naval Intelligence Support Center, Washington, D. C. Translation Div.
THE EFFECT OF THE TRANSLATIONAL VELOCITY ON THE AERODYNAMIC CHARACTERISTICS OF AIR CUSHION VEHICLES WITH A NONCIRCULAR PLANE CONFIGURATION
L. F. Kalitiyevskiy 25 Jul. 1977 5 p refs Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 19, 1970 p 3-5
(AD-A044290; NISC-Trans-3948) Avail: NTIS HC A02/MF A01 CSCL 01/3

The circular plane configuration for air cushion vehicles (ACV) is the optimum one from the viewpoint of lift properties. However, vehicles with an elongated plane configuration are used because of design considerations: rectangular, rectangular with rounded corners, oval, and elliptical. The method of calculating the aerodynamic characteristics of ACV during translational motion presented can also be used for air cushion vehicles with a noncircular plane configuration. GRA

N78-10332# Oak Ridge Y-12 Plant, Tenn.
COATING OF SURFACES BY PLASMA SPRAYING

V. M. Hovis, Jr. 1 Mar. 1977 29 p
(Contract W-7405-eng-26)
(Y/DA-7102) Avail: NTIS HC A03/MF A01

The use of the arc-plasma torch to heat and deposit material upon substrate surfaces is described. The process is capable of producing a variety of coatings to meet unique property requirements. Operation of a plasma-spray torch, types of materials sprayed, coating properties, and practical applications of the process in industry and in the laboratory are described. ERA

N78-10333# National Bureau of Standards, Washington, D. C. Inst. for Applied Technology.
EVALUATION OF METAL VOLUMETRIC STANDARDS USED IN THE MEASUREMENT OF LIQUID HYDROCARBONS: A REPORT OF A US NATIONAL BUREAU OF STANDARDS AND AMERICAN PETROLEUM INSTITUTE RESEARCH ASSOCIATE PROJECT Final Report, Apr. 1970 - Jul. 1975
D. J. Hine Apr. 1977 203 p refs Sponsored in part by Am. Petrol. Inst.
(PB-269878/5; NBSIR-77-1214) Avail: NTIS HC A10/MF A01 CSCL 14B

As a result of several surveys, it was learned that a need existed to establish uniform application procedures and investigate measurement accuracy. To answer this need, a joint project under the Research Associate program of the U.S. National Bureau of Standards was established. Equipment and techniques were evaluated and the program resulted in an equipment specification, a recommended procedure for inspection and calibration of metal volumetric standards used by weights and measures jurisdictions and the petroleum industry. GRA

N78-10334# National Bureau of Standards, Washington, D. C.
REPORT OF THE PROCEEDINGS OF THE 61ST NATIONAL CONFERENCE ON WEIGHTS AND MEASURES Final Report
Patricia Ann Raschella, ed. Jul. 1977 307 p Conf. held at Wash., D. C., 12-16 Jul. 1976
(PB-269774/6; NBS-SP-471; LC-26-27766) Avail: NTIS HC A14/MF A01 CSCL 14B

Topics discussed include metrification, weights and measure standards problems of tare weights, tolerances, and consideration of consumer-oriented issues. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N78-10335 Illinois Inst. of Tech., Chicago.
SCATTERING OF ELECTROMAGNETIC WAVES FROM RANDOMLY MOVING AND ROUGH NON-PLANAR SURFACES Ph.D. Thesis
Mohamed Kamel Abdelazeez 1977 117 p
Avail: Univ. Microfilms Order No. 77-1339

The application of the reformulated current method to scattering from smooth moving surfaces was investigated. The applicability of several methods for the study of scattering from rough, stationary surfaces was also examined. In the reformulated current method, the moving surface was replaced by equivalent current sources; the motion was retained in these sources. Both deterministic and non-deterministic motion were assumed. The surfaces considered were a sphere and infinitely long cylinder. For non-deterministic motion, the mean of the electromagnetic field was obtained. An infinite integral transform was used to investigate wave scattering from a rough cylinder in which the surface was characterized in terms of its surface impedance. Two types of polarization are treated. A similar procedure is applied to a rough sphere. Dissert. Abstr.

N78-10336 Arizona Univ., Tucson.
DIFFRACTION OF AN H-POLARIZED ELECTROMAGNETIC WAVE BY A CIRCULAR CYLINDER WITH AN INFINITE AXIAL SLOT Ph.D. Thesis
Jeffrey Allen Beren 1977 93 p
Avail: Univ. Microfilms Order No. 77-15347

Three methods of solution are provided for the problem of scattering and diffraction of a TE polarized plane wave by an infinite circular cylinder having an infinite axial slot. In one method of solution, the aperture field integral equation (AFIE) method, the fields in and around the cylinder are found from the aperture E field and the cylindrical Green's functions for the interior and exterior of a cylinder. In the other two methods the fields are determined from the surface current and solution of the H field integral equation (HFIE) or the E field integral equation (EFIE). The field in the aperture of the cylinder is found by the three methods and the advantages of each method of solution are discussed. In addition it is also shown that for shell thickness less than 1/20th of a wavelength, the aperture fields do not differ significantly from those of an infinitely thin shell cylinder. Dissert. Abstr.

N78-10337 City Univ. of New York.
THE STATIC AND DYNAMIC MEAN SCATTERING CROSS-SECTIONS FROM ROUGH SURFACES Ph.D. Thesis
Seung Kack Cha 1977 166 p
Avail: Univ. Microfilms Order No. 77-14587

The phenomena of scattering from rough surfaces were studied by examining three scattering problems: backscattering from an isotropic rough surface, scattering near grazing angle from a moving ocean surface and Doppler scattering from a stationary surface by moving source-observer. The rough surface was assumed to be a real, isotropic Gaussian surface height random process with Gaussian surface height and Gaussian-travelling wave-like surface height correlation function for the static and dynamic rough surfaces, respectively. The surface was considered to be an ideal conductor. The static and dynamic ensemble averaged mean scattering cross sections and ensemble and time averaged temporal frequency spectra are evaluated. The ensemble averages are obtained for arbitrary Gaussian surface height realizations. The results show good agreement with measured data. Dissert. Abstr.

N78-10338 Houston Univ., Tex.
COUPLED YAGI-UDA ARRAYS OF DIPOLES Ph.D. Thesis
Chun Chi Lee 1976 183 p
Avail: Univ. Microfilms Order No. 77-13634

The propagating mode on a three-row Yagi-Uda array of cylindrical wires was studied. The current distribution on each element, the phase velocity, and the cutoff frequency of the propagating mode was first found by a numerical method, and then by a method of assumed current distribution. It was found that these two different approaches resulted in a difference of less than 7% in kappa-beta curves and less than 3% in current distributions. Measurements of the phase velocity, current distribution, and transverse field intensity of propagating modes on a three-row Yagi array were carried out. The array was embedded in polystyrene foam and the operating frequency was in the range 1.0-1.5 GHz. Data showed that propagating waves could be supported on the structure without significant attenuation for certain frequency band. The kappa-beta diagram of the waves was obtained and found in good agreement with theory. Dissert. Abstr.

N78-10339 City Univ. of New York.
NON-SPECTRAL REPRESENTATIONS IN OPEN WAVE-GUIDES Ph.D. Thesis
Martin Howard Tesler 1977 199 p
Avail: Univ. Microfilms Order No. 77-13673

Transverse electric and transverse magnetic polarized fields are analyzed in detail for a variety of dielectric waveguides with arbitrary analytic transverse permittivity variation. For each polarization it is shown that the field can be represented as an infinite sum of functions, including the finite number of spectral (surface wave) and an infinity of non-spectral (complex) solutions. Additional functions are also included. Both the field polarization and the behavior of the permittivity at the waveguide interface(s) are found to affect the form (and in the case of the dielectric fiber, the validity) of the representation. The non-spectral field theory is used to analyze a grating coupler and a dielectric waveguide with a random wall variation. Expressions are obtained for the efficiency, scattered field, radiated power, and attenuation

coefficient associated with the grating coupler, and for the ensemble average of the power lost by an incident surface wave due to the random wall variation. Dissert. Abstr.

N78-10340# Institute for Telecommunication Sciences, Boulder, Colo.
CONVENTIONAL AND OPTICAL TRANSMISSION LINES FOR DIGITAL SYSTEMS IN A NOISY ENVIRONMENT
R. L. Gallawa Mar. 1977 69 p refs
(OT-77-114) Avail: NTIS HC A04/MF A01

The following topics are discussed: (1) pulse distortion in metallic cables; (2) effective shielding of coaxial cables in a noisy environment; and (3) the possible use of optical fibers to obviate these two problems. Author

N78-10341*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MONTE CARLO SIMULATION OF WAVE SENSING WITH A SHORT PULSE RADAR
D. M. LeVine, L. D. Davisson (Maryland Univ., College Pk.), and R. L. Kutz Oct. 1977 23 p refs
(NASA-TM-X-71412; X-953-77-239) Avail: NTIS HC A02/MF A01 CSCL 17I

A Monte Carlo simulation is used to study the ocean wave sensing potential of a radar which scatters short pulses at small off-nadir angles. In the simulation, realizations of a random surface are created commensurate with an assigned probability density and power spectrum. Then the signal scattered back to the radar is computed for each realization using a physical optics analysis which takes wavefront curvature and finite radar-to-surface distance into account. In the case of a Pierson-Moskowitz spectrum and a normally distributed surface, reasonable assumptions for a fully developed sea, it has been found that the cumulative distribution of time intervals between peaks in the scattered power provides a measure of surface roughness. This observation is supported by experiments. Author

N78-10342# Verve Research Corp., Rockville, Md.
STUDY REQUIREMENTS FOR AN INTEGRATED AIR/GROUND COMMUNICATIONS FACILITY Final Report, Jun. 1975 - Aug. 1976
J. Hansen, A. Webster, and B. Reynolds May 1977 333 p refs
(Contract DOT-FA75WAI-570)
(AD-A042514/0; VS-29) Avail: NTIS HC A15/MF A01 CSCL 17/2

The structure, performance, maintenance, and versatility of FAA air/ground communication facilities are evaluated, using a system approach to analyze requirements and costs. Guidelines were developed for effectively defining air/ground facilities to support present and future operations of the National Airspace System. As a primary example, an integrated OAKLAND ARTCC model was designed which consolidates its associated communication facilities, and is responsive to its operational and maintenance requirements. Author

N78-10343# National Aviation Facilities Experimental Center, Atlantic City, N. J.
TEST AND EVALUATION OF THE DALLAS/FORT WORTH TERMINAL COMMUNICATIONS SWITCHING SYSTEM Final Report, May - Jun. 1975
Richard W. Cleary, Anthony Spingola, Stephen Karovic, and P. E. Hinely Nov. 1976 79 p
(FAA Proj. 063-221-000)
(AD-A040665/2; FAA-NA-75-61) Avail: NTIS HC A05/MF A01 CSCL 17/2

An operational and technical evaluation is reported of the Air Traffic Control (ATC) Terminal Communications Switching System (TCSS) at the Dallas/Fort Worth Tower terminal Radar Approach Control (TRACON) facility. The system is innovative in its use of frequency division multiplexing techniques for ATC instead of conventional communication-channel separation methods. The following are other TRACON communication innovations: communications are carried over a single coaxial cable in the 10-MHz to 15-MHz band; solid state logic circuitry is used for electronic switching of voice and radio-remoting interconnections; positional communications reconfiguration is under processor control; and all direct access keys and radio-select keys use light-emitting diodes for designators. In addition to a technical evaluation of equipment performance, an evaluation of the ATC operational performance of the TCSS was conducted using facility personnel. Responses indicated that, with minor exceptions, the system satisfies requirements. Learning to operate a system position requires a minimal amount of training, and the system has the capabilities of growth and flexibility. Author

N78-10344*# Kansas Univ., Lawrence. Remote Sensing Lab.
RADAR SYSTEMS FOR A POLAR MISSION, VOLUME 1 Final Report
R. K. Moore, J. P. Claassen, R. L. Erickson, R. K. T. Fong, M. J. Komen, J. McCauley, S. B. McMillan, and S. K. Parashar Feb. 1977 88 p refs
(Contract NAS5-22325)
(NASA-CR-156640; RSL-TR-291-2-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 17I

Use of radar is indicated for observation of phenomena in the polar regions. The present status is reviewed of radar observation of sea ice (quasi-operational from aircraft), glaciers (little known), and icebergs (feasible but little research, and problems in discriminating icebergs from ships). Techniques for satellite observation are presented, with emphasis on use of a Scanning Synthetic-Aperture Radar (SCANSAR) of modest resolution to achieve the wide swathwidth required for frequently repeated coverage. Methods for processing SCANSAR data onboard the satellite were investigated, and some 5 methods appear feasible at the present time, although more research is needed. Use of CCD and SAW devices appears particularly promising in the achievement of low-power-consumption processors, but the rapid advancement of the digital art means that sampled-data analog processors using CCD and MOS devices must continually be compared with their digital competitors to determine which is best at the time a design decision must be made. Author

N78-10345*# Kansas Univ., Lawrence. Remote Sensing Lab.
RADAR SYSTEMS FOR A POLAR MISSION, VOLUME 3, APPENDICES A-D, S, T Final Report
R. K. Moore, J. P. Claassen, R. L. Erickson, R. K. T. Fong, B. C. Hanson, M. J. Komen, S. B. McMillan, and S. K. Parashar Jun. 1976 143 p ref
(Contract NAS5-22325)
(NASA-CR-156641; RSL-TR-291-2-Vol-3) Avail: NTIS HC A07/MF A01 CSCL 17I

Success is reported in the radar monitoring of such features of sea ice as concentration, floe size, leads and other water openings, drift, topographic features such as pressure ridges and hummocks, fractures, and a qualitative indication of age and thickness. Scatterometer measurements made north of Alaska show a good correlation with a scattering coefficient with apparent thickness as deduced from ice type analysis of stereo aerial photography. Indications are that frequencies from 9 GHz upward seem to be better for sea ice radar purposes than the information gathered at 0.4 GHz by a scatterometer. Some information indicates that 1 GHz is useful, but not as useful as higher frequencies. Either form of like-polarization can be used and it appears that cross-polarization may be more useful for thickness measurement. Resolution requirements have not been fully established, but most of the systems in use have had poorer resolution than 20 meters. The radar return from sea ice is found to be much different than that from lake ice. Methods to decrease side lobe levels of the Fresnel zone-plate processor and to decrease the memory requirements of a synthetic radar processor are discussed. Author

N78-10346*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DISASTER WARNING SYSTEM STUDY SUMMARY
B. F. LeRoy, J. E. Maloy, R. C. Braley, C. E. Provencher, H. A. Schumaker, and M. E. Valgora Oct. 1977 21 p
(NASA-TM-73797; E-9366) Avail: NTIS HC A02/MF A01 CSCL 17B

A conceptual satellite system to replace or complement NOAA's data collection, internal communications, and public information dissemination systems for the mid-1980's was

defined. Program cost and cost sensitivity to variations in communications functions are analyzed. Author

N78-10347*# Public Service Satellite Consortium, San Diego, Calif.
DEVELOPING SATELLITE COMMUNICATIONS FOR PUBLIC SERVICE: PROSPECTS IN FOUR SERVICE AREAS
30 Sep. 1977 203 p refs
(Contract NAS5-23865)
(NASA-CR-156637) Avail: NTIS HC A10/MF A01 CSCL 17B

The Public Service Satellite Consortium evaluated prospects for satellite telecommunications in four areas of the public service: the U.S. health care system, elementary and secondary education, American libraries, and that sector of the public service which is concerned with the provision of continuing education to health professionals. Three important conclusions were reached. First, throughout the public service there are three recurring needs: improved access, cost containment, and maintenance of quality. Appropriate application of communication satellite systems could ameliorate each of these concerns. Second, there appears to be an enormous latent demand for data communication services throughout the public service. The potential demand in 1982 to support requirements in hospital administration, library services and other information-retrieval activities, equipment maintenance, and environmental monitoring may be in excess of $300 million a year. Third, administrative applications of data communication networks show particular promise, especially in rural areas. Author

N78-10348# State Univ. of New York, Albany.
SCATTERING OF ELECTROMAGNETIC RADIATION BY APERTURES. 11. THE OPEN CYLINDRICAL TUBE OF FINITE LENGTH: AXIAL ELECTRIC FIELD, INTERIOR AND EXTERIOR SURFACE CHARGE DENSITY AND EXTERIOR SURFACE CURRENT DISTRIBUTION
J. P. Heckl, L. F. Libelo, C. L. Andrews, and D. P. Margolis 1 Mar. 1977 109 p refs Prepared in cooperation with Naval Surface Weapons Center, White Oak, Md.
(Contract N60921-75-C-0131)
(AD-A041199; NSWC/WOL/TR-76-74) Avail: NTIS HC A06/MF A01 CSCL 20/14

Using linearly polarized plane electromagnetic radiation we irradiated finite length, conducting, circular cylinders at normal broadside incidence. These tubes were thin walled, open at both ends and empty. Measurements of the radial electric field component at the axis were made and the results are discussed. For tube dimensions comparable to the wavelength of the incident radiation measurements were also made of the internal and external charge densities and the exterior surface current distributions. Comparison with available theory is discussed. Author (GRA)

N78-10349# Science Applications, Inc., La Jolla, Calif.
PROPAGATION EFFECTS OF STEEP STRIATIONS Progress Report, 1 Nov. 1975 - 30 Nov. 1976
David L. Sachs 30 Nov. 1976 43 p refs
(Contract DNA001-75-C-0033)
(AD-A041456; SAI-76-847-LJ; DNA-4170T) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report describes the fluctuations in intensity that occur when a radio signal traverses striated ionization. The difference in the severity of the effects for steep and gentle striation edges is shown to be a function of the product of signal wavelength and distance from the striations. Author (GRA)

N78-10350# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
ABSORPTION OF ELECTROMAGNETIC RADIATION IN THE TRANSPARENT REGIME OF SOLIDS Final Report, 14 Oct. 1974 - 13 Oct. 1975
Shashanka S. Mitra Mar. 1977 12 p refs
(Grant DAHC04-75-G-0060)
(AD-A042226; URI-9804/4528; ARO-12900.6-R-P) Avail: NTIS HC A02/MF A01 CSCL 20/12

Interaction of high power laser radiation with matter has been considered. In particular, one- and multiphoton absorption coefficients in direct gap semiconductors have been calculated using a number of theoretical models and compared with experimental data. Selective multiple photon absorption by an anharmonic molecule has been treated including the effects of the rotational sublevels and the Stark broadening of the energy levels. The applicability has been examined of the extended avalanche breakdown process to describe window surface damage by pulsed CO2 lasers. A low-loss isolator for 5.26 micrometer radiation utilizing the Zeaman effect in gases has been proposed. GRA

N78-10351# Virginia Polytechnic Inst. and State Univ., Blacksburg.
MAXIMUM LIKELIHOOD ESTIMATION OF THE POSITION OF A RADIATING SOURCE IN A CLOSED WAVEGUIDE
Melvin J. Hinich May 1977 14 p refs
(Contract N00014-75-C-0494)
(AD-A042452; TR-8) Avail: NTIS HC A02/MF A01 CSCL 20/14

An array of sensors is receiving radiation from a source of interest. The source and the array are in closed three dimensional waveguide. The maximum-likelihood estimators of the coordinates of the source are analysed under the assumptions that the noise field is Gaussian, and the source lies on a finite linear manifold spanned by a set of orthogonal functions. These functions are the eigen-functions of the wave operator given the boundary conditions defining the waveguide, and are called normal modes. The Cramer-Rao lower bound is of the order of the number of modes which define the source excitation function. Author (GRA)

N78-10352# Naval Research Lab., Washington, D. C. Tactical Electronic Warfare Div.
MICROWAVE FREQUENCY DIVISION OVER OCTAVE BANDS Interim Report
C. W. Wallace Jun. 1977 21 p refs
(ZF34372001)
(AD-A042333; NRL-MR-3497) Avail: NTIS HC A02/MF A01 CSCL 09/5

In many areas of electronic system design and engineering there exists a need for improved methods of processing microwave frequencies. A key component in future designs could be a broadband frequency divider. This report discusses a divide-by-two circuit utilizing regenerative modulation having an input frequency range of 500 MHz to 1 GHz and a similar circuit having an input frequency range of 250 MHz to 500 MHz that were developed. When the two circuits are cascaded the net result is a device that will accept any signal between 500 MHz and 1000 MHz (pulsed or CW) and provide an output equal to the input frequency divided by four. Outstanding features of the circuits are the ability to down-convert a band of frequencies while maintaining the same bandwidth percentage, the ability to maintain a fixed phase relationship with a given input frequency, and operation over wide frequency ranges. Author (GRA)

N78-10353# Naval Postgraduate School, Monterey, Calif.
EXPERIMENTAL DESIGNS AND ANALYSES FOR INITIAL ACCAT TEST BED EXPERIMENTAL DEMONSTRATIONS
Donald R. Barr, Gary K. Poock, and Francis R. Richards Apr. 1977 85 p
(AD-A042305; NPS-55-77-21) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report documents the experimental designs and associated analyses recommended for the initial test bed experimental demonstrations at NOSC, San Diego. The areas in which initial demonstrations are to be conducted include: (1) displays; (2) TECA; (3) man-machine interface with LADDER; and (4) man-machine interface with RITA. Author (GRA)

N78-10354# Stanford Univ., Calif. Edward L. Ginzton Lab.
COHERENT ANTI-STOKES RAMAN SPECTROSCOPY Final Report
Robert L. Byer and M. A. Henesian Mar. 1977 20 p refs
(Contract N00014-75-C-0894)
(AD-A042273; SU-GL-2684) Avail: NTIS HC A02/MF A01 CSCL 20/6

The first high resolution cw CARS measurements of H2, D2 and CH4 have been carried out. The preliminary experimental results have verified the predicted CARS signal strengths and

CARS lineshapes. The measurements have shown that ultra-high resolution Raman spectroscopy by the cw CARS method is a very useful spectroscopic tool. GRA

N78-10355# Stanford Univ., Calif. Radioscience Lab.
SUPPRESSION EFFECTS ASSOCIATED WITH VLF TRANSMITTER SIGNALS INJECTED INTO THE MAGNETOSPHERE
Rajagopalan Raghuram Mar. 1977 110 p refs
(Contract N00014-76-C-0689; Grants NSF ATM-75-07707; NSF DPP-74-04093)
(AD-A042245; SU-SEL-77-007; SU-TR-3456-3) Avail: NTIS HC A06/MF A01 CSCL 20/12

Magnetospheric growth of coherent VLF signals transmitted from Siple Station, Antarctica is inhibited by whistler mode echoes of earlier transmitter signals. This new phenomenon, called echo-induced suppression, is observed at least a third of the time that transmissions from Siple Station are detected at the receiving station in Roberval, Quebec, Canada. Suppression levels as high as 20 dB are observed. Though the echo is usually much weaker than the direct signal the level of suppression is directly related to the amplitude of the echo. The echoes reduce triggering of emissions as well as the growth of the signal. Echo-induced suppression is not explained by linear wave-wave interference. The echoes are thought to restrict growth by reducing the coherence of the total input signal. According to quasi-linear theory, wave growth is regulated by changes in the particle pitch angle distribution that results from wave-particle interaction. These new results suggest that coherent waves tend to limit their own growth, even when modification of the particle pitch angle distribution is unimportant. Other phenomena such as whistler-induced suppression of signal growth are thought to be related to echo-induced suppression. Wave-induced growth suppression provides an indirect verification of the existence of discrete ducts for the propagation of VLF signals in the magnetosphere. GRA

N78-10356# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.
HIDE REVISED WAVELENGTH RESOLUTION EMISSION AND TRANSMISSION MODEL Interim Technical Report
Mar. 1974 228 p
(Contract DAAJ01-72-C-0447)
(AD-A042624) Avail: NTIS HC A11/MF A01 CSCL 20/6

This report describes the high resolution atmospheric transmission and exhaust gas emission models to be incorporated into the HIDE(Helicopter infrared detection estimate) computer model. HIDE is intended to predict the infrared signature of suppressed aircraft. 'Suppressed', as used here, implies masking of all hot metal, diluting exhaust plume gases and reducing body contrast with the background. Attention must be applied to the entire spectrum of interest (1-16 microns) and over long paths (such as 40 air masses for a line of sight tangent to the horizon). This is because the signatures of self emitting sources are influenced by the relatively short intervening paths and generally dominate some spectral interval. The body contrast signature, however, is comprised from remote sources (i.e. sun, sky, albedo, etc.) which traverse long atmospheric paths to illuminate the target and this signal is contrasted against a remote background (horizon, terrain, clouds, etc.) whose radiance has also been operated on by long path constituents. GRA

N78-10357# Mississippi Univ., University.
DYNAMIC ANALYSIS OF A LOADED CONICAL ANTENNA OVER A GROUND PLANE Final Report
Donald R. Wilton Jul. 1977 91 p refs 2 Vol.
(Grants AF-AFOSR-2825-75; AF-AFOSR-2832-75; AF Proj. 1209)
(AD-A042347; AFWL-TR-77-55) Avail: NTIS HC A05/MF A01 CSCL 09/5

Three integral equations are derived and formulated for numerical solution for the currents induced on a resistively loaded conical antenna over a ground plane. The first integral equation is a relatively simple one for a cone without a topcap. The second and third integral equations are applicable to a cone with or without a topcap, but the latter equation is relatively cumbersome, involving complicated kernels with various singularities. A computer code has been developed for each of the three methods. Numerical data for current distributions input impedances and radiation patterns are presented for resistively loaded and unloaded structures, both with and without topcap.
Author (GRA)

N78-10358# Ohio State Univ., Columbus. ElectroScience Lab.
ADAPTIVE ARRAYS FOR AM AND FM SIGNALS Quarterly Report, 1 Mar. - 31 May 1977
R. T. Compton, Jr. Jun. 1977 11 p ref
(Contract N00019-77-C-0156)
(AD-A042642; ESL-4618-3) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report describes progress under Naval Air Systems Command Contract N00019-77-C-0156 during the second quarterly period. Research on the problem of integrating adaptive arrays into conventional modulation systems is summarized.
Author (GRA)

N78-10359# Mississippi Univ., University.
STATIC ANALYSIS OF CONICAL ANTENNA OVER A GROUND PLANE Final Report
Donald R. Wilton Jun. 1977 42 p refs
(Grants AF-AFOSR-2825-75; AF-AFOSR-2832-75; AF Proj. 1209)
(AD-A042352; AFWL-TR-77-3) Avail: NTIS HC A03/MF A01 CSCL 09/5

A static integral equation for the charge distribution on a cone over a conducting ground plane is developed. Numerical results are presented for the charge distribution, capacitance, and effective height of cones both with and without a topcap.
Author (GRA)

N78-10360# California Univ., Los Angeles. Dept. of System Science.
GROUP RANDOM-ACCESS DISCIPLINES FOR MULTI-ACCESS BROADCAST CHANNELS
Rubin Izhak Jun. 1977 70 p refs
(Contract N00014-75-C-0609; Grant NSF ENG-75-03224)
(AD-A042551; UCLA-ENG-7745) Avail: NTIS HC A04/MF A01 CSCL 17/2

A Group Random-Access (GRA) access-control discipline for a multi-access communication channel is presented and studied. A GRA Scheme uses only certain channel time-periods to allow some network terminals to transmit their information-bearing packets on a random-access basis. The channel can thus be utilized at other times to grant access to other terminals, or other message types, by applying, as appropriate, group random-access, reservation or fixed access-control procedures. GRA schemes could also be utilized to provide channel access to various network protocol packets. The average packet delay under a GRA discipline is evaluated by a Markov ratio limit theorem. To stabilize the channel, the GRA procedure is controlled dynamically by a control policy which rejects any newly arriving packets within certain time-periods. Studying the associated Markov decision problem, the optimal control policy is characterized as yielding a minimal average packet delay under a prescribed packet probability of rejection. This policy is shown to be a single-threshold scheme for which there exists a threshold value which attains the minimum probability of rejection. Performance curves are presented to demonstrate the excellent delay-throughput characteristics induced by GRA procedures.
Author (GRA)

N78-10361 Accession not used.

N78-10362# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LINEAR PREDICTION AND MAXIMUM ENTROPY SPECTRAL ANALYSIS FOR RADAR APPLICATIONS
Stephen B. Bowling 24 May 1977 74 p refs
(Contract F19628-76-C-0002; DA Proj. 8X3-63304-D-215)
(AD-A042817; RMP-122; ESD-TR-77-213) Avail: NTIS HC A04/MF A01 CSCL 17/9

For most applications in radar data processing, the Fourier transform performs satisfactorily. However, other methods of spectral analysis can offer some advantages when a data set is too short for a Fourier transform to resolve or detect important spectral features. This report describes one alternative technique, maximum entropy spectral analysis (MESA), and suggests possible radar applications including range-Doppler sizing and the coherent measurement of range rate. Practical examples demonstrate an improvement in velocity resolution and cross-range resolution. Computer codes are listed that calculate MESA power spectra for a real or complex discrete time series. Author (GRA)

N78-10363# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE APPLICATION OF THE CRAMER-RAO BOUND TO ESTIMATES OF RADAR RETURN TIME-OF-ARRIVAL FOR SEVERAL TARGET CONFIGURATIONS
Chaw-Bing Chang and Robert W. Miller 23 May 1977 50 p refs
(Contract F19628-76-C-0002; DA Proj. 8X3-63304-D-215)
(AD-A042751; TN-1977-27; ESD-TR-77-111) Avail: NTIS HC A03/MF A01 CSCL 17/9

In this report, certain applications of the Cramer-Rao bound to problems in radar echo time-of-arrival estimation are presented. These applications encompass point target echos, two-point target echos, and distributed target echos. With respect to point targets and two-point targets, a modified Cramer-Rao bound is derived and the results are substantially tighter than those of the conventional Cramer-Rao bound. In applying the Cramer-Rao bound to distributed targets, a sampled-data formulation is presented and a numerical example corresponding to a wake parameter estimation problem is given to illustrate the results. Author (GRA)

N78-10364# Naval Research Lab., Washington, D. C. Radar Analysis Staff.
MTI NOISE INTEGRATION LOSS Final Report
G. V. Trunk 15 Jul. 1977 12 p refs
(RR0210541)
(AD-A042926; NRL-8132) Avail: NTIS HC A02/MF A01 CSCL 17/9

MTI signal processing correlates the independent input noise and thus degrades detection performance when the MTI pulses are integrated. By use of simulation techniques the noise integration loss is calculated for small and intermediate sample sizes, for which the ouptut is not Gaussian distributed. The losses for two-, three-, four-, and five-pulse MTIs are approximately 1.0, 1.8, 2.2, and 2.5 db respectively. Author (GRA)

N78-10365# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.
PATTERN MAGNITUDE SYNTHESIS FOR REACTIVELY LOADED CIRCULAR ANTENNA ARRAY
John Luzwick and Roger F. Harrington Aug. 1977 42 p refs
(Contract N00014-76-C-0225)
(AD-A043804; TR-77-6) Avail: NTIS HC A03/MF A01 CSCL 17/2

This report presents a method for synthesizing a given radiation field magnitude pattern for a reactively loaded circular dipolar array. The reactively loaded circular dipole array has the center dipole fed and the outer dipoles parasitically excited with reactive loads across their input terminals. Both seven and thirteen element arrays are considered. A Rosenbrock optimization algorithm is applied directly to the synthesis error function to determine the reactive loads required for minimum error. Any arbitrarily shaped magnitude pattern can be treated. The pattern magnitude synthesis results for the reactively loaded array are compared to that of an optimally excited array. A computer program for the optimization algorithm with operating instructions is included. Author (GRA)

N78-10366# Air Force Avionics Lab., Wright-Patterson AFB, Ohio. System Avionics Div.
PROJECT STRESS SATELLITE COMMUNICATION TEST RESULTS Final Technical Report, Jun. 1976 - Apr. 1977
C. Prettie, A. Johnson, J. Marshall, T. Grizinski, and R. Swanson Jul. 1977 125 p refs
(AD-A043873; AFAL-TR-77-158) Avail: NTIS HC A06/MF A01 CSCL 17/2

In order to evaluate the effects of a nuclear disturbance of the ionosphere on UHF satellite communication, barium ions were released in the ionosphere. The test, nicknamed STRESS, was sponsored by the Defense Nuclear Agency. The drift of the barium ions across the magnetic field lines cause the ions to consolidate in rods, or sheets, causing diffraction of radio waves passing through the ionosphere. AFAL's Satellite Communication System aboard a C-135 type aircraft was flown in the shadow of the cloud and communicated through the ionospheric disturbance to the LES 8/9 UHF satellites. Measurements were made of the fading characteristics and bit error rate performance when communicating through the ionospheric disturbance. Author (GRA)

N78-10367# Army Engineer Topographic Labs., Fort Belvoir, Va.
BIMODAL DISPLAY
Jenny Bramley and Edward G. Trelinskie, Jr. Jun. 1977 17 p
(DA Proj. 4A1-61101-A-91D)
(AD-A043869; ETL-0110) Avail: NTIS HC A02/MF A01 CSCL 17/2

This report describes concepts, techniques, and results from experiments conducted using an experimental display device configured for display of map information and symbol presentations on a single viewing surface. Author (GRA)

N78-10368# Army Missile Research and Development Command, Redstone Arsenal, Ala. Advanced Sensors Directorate.
MILLIMETER AND SUBMILLIMETER WAVE RECEIVERS
Jerry Waldman 15 Jul. 1977 54 p refs
(DA Proj. 1L3-62303-A-214)
(AD-A043581; DRDMI-TE-77-17) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report reviews the current state-of-the-art performance figures for millimeter and submillimeter wave detectors and receiver systems. The frequency range under consideration is roughly 100 to 600 GHz. In contrast to the microwave (and optical) region where detectors perform close to the ideal limit, present millimeter and submillimeter wave detector sensitivities are one to two orders of magnitude away from the ideal. This situation does not represent any fundamental limitation but rather reflects technological problems in detector and source development peculiar to this region of the spectrum. At the present time, rapid technological progress is occurring as a consequence of (1) the demand from fields such as radio astronomy, fusion diagnostics, and high resolution radar, and (2) the breakthroughs in microelectronic techniques, ultra-high frequency solid-state sources, tubes, and lasers. These developments are reviewed and the implications for millimeter wave radar systems are discussed. Author (GRA)

N78-10369# Digital Communications Corp., Gaithersburg, Md.
COMMUNICATIONS SYSTEMS MODELING STUDY Final Report
Reinhard Stammiger and Wilbur L. Pritchard 26 Nov. 1976 186 p
(AD-A043352) Avail: NTIS HC A09/MF A01 CSCL 17/2

This report summarizes the results of a study on the

transmission of digitally encoded voice channels, with several multiple access techniques and traffic patterns. Sixteen kb/s variable slope delta modulation and three modulation/access techniques were studied: PSK-SCPC, TDM-PSK-FDMA and TDMA. Three hypothetical traffic models were generated, ranging in traffic from 80 to 1100 one-way voice channels with 10 to over 200 earth stations. GRA

N78-10370# Harris Corp., Melbourne, Fla. Electronic Systems Div.

CROSS POLARIZATION TECHNIQUES INVESTIGATION Final Technical Report, Sep. 1975 - 21 Jan. 1977

C. A. Baird and G. Pelchat Griffiss AFB, N. Y. RADC Jul. 1977 283 p

(Contract F30602-76-C-0041)

(AD-A043395; RADC-TR-77-244) Avail: NTIS HC A13/MF A01 CSCL 17/2

The major objective of the cross polarization techniques investigation was to investigate the use of cross polarization to expand the bandwidth efficiency over line-of-sight (LOS)digital microwave links in the Defense Communications System (DCS) and to develop techniques that will improve the cross polarization utility. Cross polarization offers an additional approach, other than improved bandwidth efficient modulation techniques, to double bandwidth efficiency by transmitting independent information on orthogonal polarized channels which use identical frequency bands. GRA

N78-10371# Naval Ocean Systems Center, San Diego, Calif.

SIMULATION AND MEASUREMENT OF HIGH FREQUENCY IONOSPHERIC CHANNELS. TIME- AND FREQUENCY-DISPERSIVE PROPERTIES OF HF SKY WAVE PROPAGATION PATHS CAN BE MODELED FOR USE IN ADAPTING SIGNAL FORMAT AND SIGNAL PROCESSING ALGORITHMS FOR COMMUNICATION SYSTEM DEVELOPMENT Interim Report, Jul. - Sep. 1976

D. B. Sailors and J. R. Hill 22 Apr. 1977 41 p refs

(XF21222091)

(AD-A043384; NOSC/TR-111) Avail: NTIS HC A03/MF A01 CSCL 17/2

The report presents literature search of HF channel simulators, describes the Watterson model and its limitations, and discusses distortion of ionospherically propagated signals due to ionospheric refraction. Significant dispersion occurs if the half-bandwidth exceeds pie/(delta TAO/delta f) to the 1/2 power, where (delta TAO/delta f) to the 1/2 power (in s/Hz) is the ionogram slope at center frequency. For 100 kHz bandwidth, dispersion is significant (delta TAO/delta f) to the 1/2 power exceeds 3.14 X 10 to the -4th ms/kHz, its measurement requiring 62.8 microsec. resolution. Recommendations: For bandwidths above 2.5 kHz at night and 12 kHz during the day, add frequency dispersion correction filters to the Watterson simulator tap delay lines. To achieve required time delay resolution, use a complementary-sequence or modulated-pulse oblique sounder system. For the microprocessor or minicomputer controlled receiver, provide an atomic time-frequency standard and interfaces for terminal, CRT display, magnetic tape recorder, and auxiliary devices. When measuring modem performance capabilities with a channel simulator, take a 'single and multiple distortions' approach. Use the Jones ray-tracing program to obtain the frequency dispersion relationships needed for applying corrective filters to the Watterson model; relate results to channel-caused system distortions. Use a suggested approach if too many delay line taps would be needed. Author (GRA)

N78-10372# Ohio State Univ., Columbus. Dept. of Electrical Engineering.

A GTD ANALYSIS OF THE CIRCULAR REFLECTOR ANTENNA INCLUDING FEED AND STRUT SCATTER Final Technical Report, Mar. 1976 - Apr. 1977

S. H. Lee, R. C. Rudduck, C. A. Klein, and R. G. Kouyoumjian Griffiss AFB, N. Y. RADC Aug. 1977 104 p refs

(Contract F30602-76-C-0224)

(AD-A043400; RADC-TR-77-259; FTR-4381-1) Avail: NTIS HC A06/MF A01 CSCL 09/1

Recently, the wide angle side lobes of a circular reflector antenna pattern were calculated by the Geometrical Theory of Diffraction and an overall pattern can be obtained from a combination of GTD and aperture integration methods. In this report, the analysis is extended to include the scattering from the feed supports. The feed support scattering is treated using the concept of equivalent current line source. The cylinder scattering model developed in this report gives the effect of strut scattering on the wide angle side lobes of the reflector. The scattering from the feed struts always has its greatest effect near the scattering cones for each strut. These scattering cones usually give rise to a maximum aperture blockage effect in certain off-principal plane patterns. The analysis given here can be used to compute the complete pattern of any arbitrary plane cut for a practical circular reflector antenna system.

Author (GRA)

N78-10373# SRI International Corp., Menlo Park, Calif.

THE IMPACT OF COMMUNICATION TECHNOLOGIES DESIGNED TO SUBSTITUTE FOR TRAVEL ON SCIENTIFIC AND TECHNICAL COMMUNICATION

Raymond R. Panko Jun. 1977 49 p refs

(Contract NSF C-1025)

(PB-269669/8) Avail: NTIS HC A03/MF A01 CSCL 17B

Multisite audio teleconferencing seems economically attractive for several types of scientific and technical communication. One example is the creation of 'satellite conference', in which remote locations housing miniconferences of several hundred people each, are acoustically tied to a large distant host conference. The creation of satellite conferences could broaden accessibility to large scientific and technical conferences and might reduce travel to major conferences. Another example is the use of audio teleconferences to hold National Science Foundation advisory committee meetings, in order to reduce travel to these meetings and perhaps to expand geographical representation. GRA

N78-10374# Sandia Labs., Albuquerque, N. Mex.

EFFECTS OF IONOSPHERIC DISPERSION ON PULSED ELECTROMAGNETIC SIGNALS

W. D. Brown Dec. 1976 16 p refs

(Contract EY-76-C-04-0789)

(SAND-76-0391) Avail: NTIS HC A02/MF A01

The distortion of pulsed electromagnetic signals resulting from propagation through the ionosphere was examined for carrier frequencies from 20 MHz to 10 GHz. The degree of pulse distortion was characterized by a dimensionless parameter, which is a function of the bandwidth, the carrier frequency, and the line integral of a function of the electron density along the propagation ray path. Values of the bandwidth computed by using a realistic profile for the ionospheric electron density were displayed and and analyzed as a function of carrier frequency for various degrees of pulsed distortion and for two elevation angles. For frequencies above 100 MHz, the usable bandwidth was proportional to the carrier frequency to the 3/2 power. As the carrier frequency decreased below 100 MHz, the bandwidth diminished more rapidly than f/sub o//supp 3/2/ ERA

N78-10178*# General Electric Co., Philadelphia, Pa.

PLASMA CHARGING TESTING OF COMMUNICATION SATELLITES

F. Rosen *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 805-813 (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 20N

N78-10179*# TRW Defense and Space Systems Group, Redondo Beach, Calif.

QUALIFICATION MODEL SPACECRAFT TESTS FOR DEMP, SGEMP, AND ESD EFFECTS

E. Paul Chivington, Peter J. Madle, and Peter H. Stadler (SAMSO, Los Angeles Air Force Station, Calif.) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 815-828 refs (For availability see N78-10129 01-12)

Avail: NTIS HC A99/MF A01 CSCL 20N

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N78-10375* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

HEARING AID MALFUNCTION DETECTION SYSTEM Patent

Roger L. Kessinger, inventor (to NASA) (Martin Marietta Corp., Denver) Issued 20 Sep. 1977 11 p Filed 8 Nov. 1976 Supersedes N77-13335 (15 - 04, p 0465) Sponsored by NASA

(NASA-Case-MSC-14916-1; US-Patent-4,049,930; US-Patent-Appl-SN-739914; US-Patent-Class-179-175.1A; US-Patent-Class-179-107R; US-Patent-Class-330-2) Avail: US Patent Office CSCL 09A

A malfunction detection system for detecting malfunctions in electrical signal processing circuits is disclosed. Malfunctions of a hearing aid in the form of frequency distortion and/or inadequate amplification by the hearing aid amplifier, as well as weakening of the hearing aid power supply are detectable. A test signal is generated and a timed switching circuit periodically applies the test signal to the input of the hearing aid amplifier in place of the input signal from the microphone. The resulting amplifier output is compared with the input test signal used as a reference signal. The hearing aid battery voltage is also periodically compared to a reference voltage. Deviations from the references beyond preset limits cause a warning system to operate. Official Gazette of the U.S. Patent Office

N78-10376* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

POWER FACTOR CONTROL SYSTEM FOR AC INDUCTION MOTORS Patent

Frank J. Nola, inventor (to NASA) Issued 4 Oct. 1977 8 p Filed 19 Jul. 1976 Supersedes N76-28471 (14 - 19, p 2454) (NASA-Case-MFS-23280-1; US-Patent-4,052,648; US-Patent-Appl-SN-706425; US-Patent-Class-318-200; US-Patent-Class-318-227; US-Patent-Class-318-230) Avail: US Patent Office CSCL 09C

A power factor control system for use with ac induction motors was designed which samples lines voltage and current through the motor and decreases power input to the motor proportional to the detected phase displacement between current and voltage. This system provides, less power to the motor, as it is less loaded.

Official Gazette of the U.S. Patent Office

N78-10377* National Aeronautics and Space Administration. Pasadena Office, Calif.

OVERLOAD PROTECTION SYSTEM FOR POWER INVERTER Patent

Satoshi Nagano, inventor (to NASA) (JPL) Issued 4 Oct. 1977 9 p Filed 15 Nov. 1976 Supersedes N77-17359 (15 - 08, p 1025) Sponsored by NASA

(NASA-Case-NPO-13872-1; US-Patent-4,052,659; US-Patent-Appl-SN-742034; US-Patent-CLASS-363-57; US-Patent-Class-363-89) Avail: US Patent Office CSCL 09C

An overload protection system for a power inverter utilized a first circuit for monitoring current to the load from the power inverter to detect an overload and a control circuit to shut off the power inverter, when an overload condition was detected. At the same time, a monitoring current inverter was turned on to deliver current to the load at a very low power level. A second circuit monitored current to the load, from the monitoring current inverter, to hold the power inverter off through the control circuit, until the overload condition was cleared so that the control circuit may be deactivated in order for the power inverter to be restored after the monitoring current inverter is turned off completely. Official Gazette of the U.S. Patent Office

N78-10378 Georgia Inst. of Tech., Atlanta.

A GENERAL APPROACH TO NETWORK EQUIVALENTS FOR ON-LINE POWER SYSTEM SECURITY ASSESSMENT Ph.D. Thesis

George Constantinos Contaxis 1977 141 p

Avail: Univ. Microfilms Order No. 77-15040

Data on actual system outages were effectively and directly used to obtain external system equivalents. The resulting scheme yields an equivalent representation of the external system with guaranteed accuracy in predicting the effect of postulated system outages for on-line steady state security assessment.

Dissert. Abstr.

N78-10379 Johns Hopkins Univ., Baltimore, Md.

ROBUST DECISION-DIRECTED FILTERING Ph.D. Thesis

George Walter Gawrys 1977 152 p

Avail: Univ. Microfilms Order No. 77-15075

The problem of recursively estimating the state of a linear dynamic system by processing noisy data in real time is investigated. If the errors in the dynamics and the sensor, which are modeled as noise, deviate from their assumed values, they are called outliers and may cause inferior estimator performances. To increase accuracy in such cases, statistical decision theory was used to enable filters to adapt to changing or incorrect parameter values. By utilizing the decision-directed approach and some properties of robust estimation, an estimate was derived which was insensitive to observation noise outliers and, at the same time, was an indicator of state noise outliers. These properties were applied to two types of input noise uncertainty.

Dissert. Abstr.

N78-10380 De Paul Univ., Chicago, Ill.

A PSYCHOPHYSICAL ANALYSIS OF VISUAL FORM DISCRIMINATION IN RIGHT AND LEFT CEREBRAL HEMISPHERES Ph.D. Thesis

Paul Gregory Salmon 1977 112 p

Avail: Univ. Microfilms Order No. 77-13720

Hemispheric laterality effects in visual perception were studied using unfamiliar geometrical forms of varying complexity. Pairs of forms were tachistoscopically presented in right or left visual fields, after which subjects judged the pair members either same or different. Reaction time and accuracy data revealed a consistent left visual field (right hemisphere) superiority, in particular for same judgements. In addition, left visual field responses were found to be slightly less susceptible to variations in stimulus complexity and inspection time. These results were viewed as consistent with parallel processing. Dissert. Abstr.

N78-10381 Illinois Inst. of Tech., Chicago.

POWER MEAN FREQUENCY ESTIMATION FOR A RANDOM PROCESS GATED AT A SUB-NYQUIST RATE Ph.D. Thesis

Jayvadan Natverlal Patel 1976 73 p

Avail: Univ. Microfilms Order No. 77-13752

Estimation of the power mean frequency of a narrowband, stationary, ergodic random process by processing a sample function of the random process is studied for the case when a gated sample function of the random process is available for processing and when the frequency of the gating function is lower than the Nyquist frequency for the random process. It is shown that the Sub-Nyquist gating rate does not impede the estimation of the power mean frequency. Estimators for processing the gated sample function at baseband and at an intermediate frequency are proposed. It is shown that the performance of these estimators is identical to the estimators for continuous wave (CW) signals when the observation time is infinite. It is concluded that when the gated signal is processed before the final sampling and summing, the Sub-Nyquist gating rate does not impede the estimation of the power mean frequency.

Dissert. Abstr.

N78-10382# Minnesota Univ., Minneapolis. Physical Electronics Lab.

STUDIES OF $Na_2KSb(Cs)$ PHOTOCATHODES Technical Report, 1 Jul. 1972 - 31 May 1975

Paul A. Lindfors Wright-Patterson AFB, Ohio AFAL May 1977 138 p refs

(AF Proj. 2001)

(AD-A042253; AFAL-TR-76-35) Avail: NTIS HC A07/MF A01 CSCL 09/1

More than 15 years after its discovery, Na2KSb(Cs) remains an important photocathode material, but control of its formation remains a problem. In these studies Auger electron spectroscopy (AES) was used to determine the atomic species present in the surface region during formation of Na2KSb(Cs) films. It was found that the electron bombardment incidental to the use of the AES technique could cause sample changes, but this problem was eliminated for samples that were heated during or after constituent depositions. Important conclusions derived from these studies are as follows: 1. Heating to temperature greater than 200 C at the 2Na - K3Sb yields 2K - Na2KSb stage of formation is probably required to produce antimony-rich material, if formation is approached from an alkali-rich standpoint. Alkali antimonide photocathodes of high sensitivity are thought to be 'p' type due to an excess of antimony. 2. The relative populations of the constituents are factors in determining which alkali species will leave when an alkali antimonide film is heated. 3. An alkali overlayer can exist on an alkali antimonide sample that is alkali-deficient in the bulk. 4. An alkali overlayer is probably present on photocathodes of high sensitivity, and Cs is probably present in that overlayer. GRA

N78-10383# RCA Labs., Princeton, N. J.

TRANSFERRED ELECTRON LOGIC DEVICE (TELD) DEVELOPMENT Annual Report, 15 Dec. 1975 - 14 Dec. 1976

L. C. Upadhyayula, R. E. Smith, and J. F. Wilhelm Apr. 1977 76 p refs

(Contract N00014-75-C-0100; RF54581001)

(AD-A042354; PRRL-77-CR-15) Avail: NTIS HC A05/MF A01 CSCL 09/2

The objectives of this research program are (1) to develop planar GaAs transferred-electron logic devices (TELDs) and (2) to fabricate and evaluate a four-bit correlator. The major accomplishments in this phase of the program were (1) significant progress in the advancement of basic device technology; (2) the use of active devices as nonlinear loads; and (3) the fabrication of critical building blocks. TELDs of the improved design type have been fabricated and evaluated. The previously used electrolytic thinning technique has been extended to GaAs wafers of the n(+)-n-n(-)type. The n(+) capping layers provide better ohmic contacts to the device and thus reduce the threshold voltage values. A capacitive pickoff output electrode has been added to the standard TELD structure. This new structure eliminates some of the memory and stability problems associated with the standard TELDs. A two-bit correlator circuit has been fabricated and evaluated. To improve the compatability of TELD input and output signal levels, active (FET) devices have been used as either load resistors or trigger elements. Pulses as small as 150 ps were processed through TELD-FET inverters with a 2-4 voltage gain. Author (GRA)

N78-10384# Minnesota Univ., Minneapolis. Physical Electronics Lab.

PHOTOCATHODE STUDY TO REDUCE NOISE Final Report, 1 Jul. 1972 - May 1975

W. T. Peria Wright-Patterson AFB, Ohio AFAL May 1977 24 p refs

(Contract F33615-72-C-2105; AF Proj. 2001)

(AD-A042254; AFAL-TR-76-38) Avail: NTIS HC A02/MF A01 CSCL 09/1

Energy loss spectroscopy was used in a study of the Ge(100)-Cs-O system. A characteristic loss at 3 eV was identified and is ascribed to a transition between surface bands. The results are interpreted in terms of a model which requires different overlayer structures (depending upon composition) and a work function minimum at 1 monolayer of Cs and 1/2 monolayer of oxygen. More than 15 years after its discovery, Na2KSb(Cs) remains an important photocathode material, but control of its formation remains a problem. In the present studies Auger electron spectroscopy (AES) was used to determine the atomic species present in the surface region during formation of Na2KSb(Cs) films. It was found that the electron bombardment incidental to the use of the AES technique could cause sample changes, but this problem was eliminated for samples that were heated during or after constituent depositions. The Ge(100)/Cs/O photosurface and surfaces at intermediate stages of activation are characterized in terms of photoemission work function, Auger electron spectroscopy (AES), low energy electron diffraction (LEED), and elastic specular electron reflectivity (ESER). An electrical and structural model is proposed for Ge/Cs/O which is consistent with this data. A number of experiments are reported which investigate the sensitivity of the Ge/Cs/O surface to deviations from chemical and structural perfection. GRA

N78-10385# Defence Research Establishment Pacific, Victoria (British Columbia).

COMPUTER-AIDED DESIGN OF LC LADDER FILTERS

R. C. Weir Dec. 1976 54 p

(AD-A042631; DREP-TM-76-10) Avail: NTIS HC A02/MF A01 CSCL 09/5

This report contains a FORTRAN program that enables the user to produce, from published tables of normalized element values, the circuit diagram and amplitude response of a desired LC ladder filter. Butterworth, Thomson and Chebyshev characteristics are included, and the filter may be low-pass, high-pass or bandpass of any order from 1 to 8. Some commonly used sets of tables are included internally. Several design examples are given. Author (GRA)

N78-10386# Florida Univ., Gainesville.

VERTICAL TRANSISTOR INVESTIGATION FOR I2L STRUCTURES Final Report, 19 Dec. 1975 - 19 May 1977

David P. Kennedy May 1977 88 p

(Contract DAAG39-76-C-0028)

(AD-A042345; HDL-CR-77-028-1) Avail: NTIS HC A05/MF A01 CSCL 09/5

A one-dimensional mathematical model is presented for the vertical transistor associated with an I2L semiconductor device. This particular model represents a modification of similar models used for bipolar transistor operation; it requires little computer time and has been subjected to extensive verification over past years. Although incomplete in its present form, the model suggested here is based upon the physical mechanisms encountered during semiconductor device operation. For this reason, it is suggested that little additional effort would be required to complete this model, including the physical mechanisms associated with damage arising from an ionizing type of radiation environment. Author (GRA)

N78-10387# Westinghouse Defense and Electronic Systems Center, Baltimore, Md.

OPERATIONAL INFLUENCES ON MAINTAINABILITY Final Technical Report, May 1974 - Dec. 1976

Lawrence Phaller and David Koo Griffiss AFB, N. Y. RADC Jul. 1977 348 p

(Contract F30602-74-C-0264)

(AD-A042983; RADC-TR-77-193; FTR-76-0728B) Avail: NTIS HC A15/MF A01 CSCL 14/4

This report presents the results of a study of the operational influences on the field maintainability of USAF ground electronic equipment. The study identifies operational factors which contribute to the increase in field equipment mean time to repair (MTTR) from values estimated during equipment development. A checklist type model is included in the report which can be used to estimate the field MTTR given a maintainability prediction and knowledge of the influencing factors. Author (GRA)

N78-10388# Radio Corp. of America, Lancaster, Pa. SSD-Electro-Optics and Devices.

MANUFACTURING METHODS AND TECHNOLOGY (MM AND T), MEASURE FOR FABRICATION OF SILICON TRANSCALENT THYRISTOR Quarterly Report, 1 Jan. - 31 Mar. 1977

S. W. Kessler, R. E. Reed, and D. R. Trout Apr. 1977 141 p refs

(Contract DAAB07-76-C-8120)

(AD-A043346; QR-2) Avail: NTIS HC A07/MF A01 CSCL 09/3

This Second Quarterly Report describes the progress on the MM and TE program for Transcalent (Heat-Pipe cooled) thyristors. A description of the device and the pertinent state-of-the-art on the engineering sample devices is included. Conclusion of redesigning for production is described for the device parts, processes and sub-assemblies. Also described are the check-out

and the modification of the high current, high voltage test equipment. Actual test results on initial devices are listed. The present status includes that refinement of the fixtures and the process specifications, the assembly and processing of device parts and subassemblies as well as the completed check-out of all but two pieces of the electrical test equipment. Plans for the next Quarter include completion of the engineering sample devices; electrical, mechanical and environmental testing of these samples as well as initiate planning of the Confirmatory sample phase. Author (GRA)

N78-10389# State Univ. of New York, Stony Brook. Dept. of Physics.

PREPARATION OF VARIABLE THICKNESS MICROBRIDGES USING ELECTRON BEAM LITHOGRAPHY AND ION ETCHING Technical Report, 31 Jul. - 31 Nov. 1976

R. D. Sandell, G. J. Dolan, and J. E. Hukens 8 Jun. 1977 6 p refs Presented at the Intern. Conf. on Superconducting Quantum Devices, Berlin, Oct. 1976

(Contract N00014-75-C-0769)

(AD-A043668) Avail: NTIS HC A02/MF A01 CSCL 09/3

Techniques have been developed for the fabrication of variable thickness constriction (VTC) microbridges. The bridges produced by these techniques display the superior characteristics found by others in VTC bridges made by scratching techniques. The EBL techniques described have the advantage of being easily applicable to fabrication of large arrays of nearly identical bridges. Author (GRA)

N78-10390# Toledo Univ., Ohio. Dept. of Electrical Engineering.

UTILIZATION OF SOURCE IMPEDANCE TO DECREASE THE WEIGHT OF D. C. POWER SUPPLY FILTERS Final Report, Jun. 1976 - Jun. 1977

Thomas A. Stuart 18 Jul. 1977 163 p refs

(Grant AF-AFOSR-2997-76)

(AD-A043432; AFOSR-77-0985TR) Avail: NTIS HC A08/MF A01 CSCL 09/3

This report presents a study of how the source impedance can be used to reduce the weight of the output filter of a rectified superconducting alternator power supply. Author (GRA)

N78-10391# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Advanced Technology Labs.

CCD ADAPTIVE DISCRETE ANALOG SIGNAL PROCESSING

Marvin H. White, Ingham A. G. Mack, Leonard L. Lewis, and Gerald M. Borsuk Jul. 1977 109 p refs

(Contract N00173-76-C-0147; XF54582002)

(AD-A043608) Avail: NTIS HC A06/MF A01 CSCL 09/3

This report describes the implementation of a recursive stochastic algorithm, the least mean square (LMS) error algorithm, in a 2-tap weight CCD adaptive filter with electrically-reprogrammable MNOS nonvolatile, analog conductance weights. Author (GRA)

N78-10392# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

INTEGRATED CIRCUIT ELECTROMAGNETIC SUSCEPTIBILITY INVESTIGATION. PHASE 3: IC SUSCEPTIBILITY HANDBOOK, DRAFT 2

J. M. Roe 3 Jun. 1977 77 p refs 2 Vol.

(Contract N60921-76-C-A030)

(AD-A043777; MDC-E1669; NSWC/DL-TR-3654) Avail: NTIS HC A04/MF A01 CSCL 18/6

The objective of this handbook is to provide system designers with integrated circuit (IC) susceptibility information in terms of microwave signals. This is the second draft of the IC Handbook for comments from eventual users. The comments on the first draft have been studied and incorporated where possible. The data in this handbook include both interference and damage susceptibility. Both types of susceptibility are evaluated through modeling and testing. Both digital and linear ICs are covered in the handbook. This version includes all data available at the end of the second of three increments. The handbook explains the electromagnetic vulnerability (EMV) hardening approach for electronic systems. On the component level susceptibility reduction techniques such as lossy ferrite materials and screening for less susceptible devices are included. The handbook includes a description of the automated measurement system used to take and analyze the IC susceptibility data. This handbook will provide designers with actual test data when available and modeling techniques to determine susceptibility information where no test data are available. Author (GRA)

N78-10393# McDonnell-Douglas Astronautics Co., St. Louis, Mo.

INTEGRATED CIRCUIT ELECTROMAGNETIC SUSCEPTIBILITY INVESTIGATION, PHASE 3 Summary Report No. 2

J. M. Roe, J. R. Chott, C. R. Chubb, C. N. Kohlbert, and C. E. Larson 3 Jun. 1977 23 p refs 2 Vol.

(Contract N60921-76-C-A030)

(AD-A043776; MDC-E1668) Avail: NTIS HC A02/MF A01 CSCL 18/6

This report summarizes in a general manner the progress made in investigations into the susceptibility of integrated circuits ICs to RF power. This is an interim report covering the work performed in the second of three increments. This increment includes expansion of the modeling effort to incorporate the transistor models into a standard circuit analysis program SPICE (Simulation Program with Integrated Circuit Emphasis) so that RF effects on ICs can be modeled. The testing necessary to support the modeling effort is also included. A complete study of the damage mechanisms suffered by ICs under RF stress is also included in this report as second increment work. This damage study includes both modeling and an extensive testing program. The changes to the first draft of the IC susceptibility handbook and the rationale behind the changes are also included in this report. Author (GRA)

N78-10394# Rhode Island Univ., Kingston. Dept. of Mathematics.

DESIGN OF MINIMUM NOISE DIGITAL FILTERS USING A MIXED NORM Interim Report

William W. Cooper, Kenneth M. Levasseur, and Oved Shisha Jun. 1977 13 p refs

(Grant AF-AFOSR-3174-77)

(AD-A043381; TR-67; AFOSR-77-0945TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

A concept of a 'mixed norm' of a function is introduced and studied. It arises from the problem of design of nonrecursive digital filters. Previous work on design of nonrecursive digital filters which are identical mathematically to uniformly-spaced linear antenna arrays, has minimized a quadratic error criterion, subject to inequality constraints on the maximum error in the filter approximation, at an arbitrary but finite number of points. Quadratic error and maximum error can be made to correspond, respectively, to total stopband noise power and maximum passband error at a single frequency. A weighted sum of the two error criteria will be minimized by use of quadratic programming. Furthermore, any solution to the constrained quadratic minimization problem will be shown to be a solution to a weighted sum minimization problem, and vice versa. GRA

N78-10395# General Electric Co., Syracuse, N.Y. Optoelectronic Systems Operation.

InSb MIS DEVELOPMENT Final Report, Dec. 1976 - Apr. 1977

J. C. Kim and J. M. Swab Aug. 1977 28 p

(Contract N00173-77-C-0022; XF54583004)

(AD-A043805) Avail: NTIS HC A03/MF A01 CSCL 17/5

Further improvement on both line and two-dimensional InSb CID arrays has been made. The sensitivity of line arrays has been improved by using thin-gate oxide and low-doping substrate materials, which reduce the input line capacitance. The co-planar two-dimensional array structure also has been further improved. Effort on a low-noise amplifier has been carried out and performance of the JFET preamplifier was much better than that of the MOSFET. The NETD for a line array was found to be 0.11 K using a JFET preamp and 0.5 K using a MOSFET. The measurement was made with a narrow spectral filter of 3.6 to 4.0 microns, f/3.25 lens system, and a 500 microsec. integration time. Author (GRA)

N78-10396# Naval Research Lab., Washington, D. C.
NRL ENGINEERING MATERIALS AND CHEMISTRY DIVISIONS STUDIES OF THE A2 TUBE FAILURE
Roy W. Rice, Steve W. Freiman, R. L. Jones, and N. Lynn Jarvis Jun. 1977 19 p refs
(AD-A043283; NRL-MR-3535) Avail: NTIS HC A02/MF A01 CSCL 09/1

This report discusses the hypothesis and supporting evidence concerning the probable major failure mode of A2 microwave tubes. Such failure occurred due to loss of adequate vacuum. It was hypothesized that cracking due to tube wall (Al_2O_3)-metal electrode stresses could cause cracks to connect pores in the Al_2O_3 to the tube interior and thus vent gas in the pores left from processing into the tube. Calculations, microstructure, and fractographic evidence from this program are reported supporting this pore mechanism. Supporting pore-outgassing, stress cracking and acoustic emission evidence from other studies is also noted. Limited tensile test trials of the tubes are also reported.
Author (GRA)

N78-10397# IBM Watson Research Center, Yorktown Heights, N.Y.
CURRENT AND C-V INSTABILITIES IN SiO2 AT HIGH FIELDS
P. M. Solomon and J. M. Aitken 2 Mar. 1977 11 p refs
(Contract F19628-76-C-0249; ARPA Order 2180; AF Proj. 2180)
(AD-A043740; RC-6457; RADC/ETR-77-0023) Avail: NTIS HC A02/MF A01 CSCL 09/1

Results have been obtained concerning the interrelation of current and C-V instabilities in MOS capacitors subjected to negative gate high field pulsing. Rising current transients and negative C-V shifts both show the formation of positive charge in the oxide. However, this charge appears to be situated close to the electrodes rather than in bulk of the oxide and the temperature dependence of the rate of charge accumulation near the electrodes is different for the aluminum and silicon electrodes.
Author (GRA)

N78-10398# Cornell Univ., Ithaca, N. Y. Materials Science Center.
NEW TYPE OF PHOTOCONDUCTION IN n-CdS
K. Nagasaka and E. Schiff Feb. 1977 14 p refs
(COO-3151-72; Rept-2796) Avail: NTIS HC A02/MF A01

Four strong resonances were observed in the far infrared transverse magnetophotoconductivity of n-CdS at 1.2 and 1.2K. The resonances were observed in the spectral range 10 - 120 cm (-1) at fields to 90 kOe. As a direct consequence of optical phonon emission two of these resonances were observed and represent a type of photoconductivity.
Author

N78-10399# Oak Ridge National Lab., Tenn.
HIGH VOLTAGE RESEARCH: BREAKDOWN STRENGTHS OF GASEOUS AND LIQUID INSULATORS Quarterly Report, period ending 31 Dec. 1976
L. G. Christophorou, D. R. James, R. Y. Pai, M. O. Pace, R. A. Mathis, D. W. Bouldin, and D. E. Tittle Feb. 1977 31 p refs
(Contract W-7405-eng-26)
(ORNL/TM-5806; QR-3) Avail: NTIS HC A03/MF A01

Research work to improve gaseous dielectrics continued. The breakdown strengths of C_6F_{10} (perfluorocyclohexene) and C_6F_{12} (mixture of 1,2- and 1,3- perfluorodimethylcyclobutane) have been found to be, respectively, 2.3 to 2.4 and 1.9 to 2.2 times higher than SF_6 under identical experimental conditions. The breakdown strengths of mixtures of C_4F_6, SF_6, c-C_4F_8, iso-C_4F_8, and C_3F_8 with N_2 have been studied systematically in various combinations in an effort to understand the role of the basic properties and effectiveness of each component of a multicomponent gas on the breakdown strength. A number of such mixtures (e.g., 20 percent C_4F_6, 20 percent SF_6, and 60 percent N_2) are better and cheaper than SF_6. Basic electron attachment data have been obtained for C_3F_8, and the overall effectiveness of inelastic processes has been assessed for a number of gases based on their electron transport coefficients.
ERA

N78-10400# National Bureau of Standards, Washington, D. C. Electronic Technology Div.
MEASUREMENT TECHNIQUES FOR HIGH POWER SEMICONDUCTOR MATERIALS AND DEVICES Annual Report, 1 Jan. - 31 Dec. 1976
D. L. Blackburn, R. Y. Koyama, F. F. Oettinger, and G. J. Rogers Mar. 1977 95 p refs
(Contract E(49-1)-3800)
(PB-269345/5; NBSIR-77-1249) Avail: NTIS HC A05/MF A01 CSCL 09A

The development of measurement methods for semiconductor materials and devices is reported. These methods lead to more effective use of high power semiconductor devices in applications for energy generation, transmission, conversion, and conservation. National needs arising from rapidly increasing demands for electricity and the present crisis in meeting long term energy demands are considered. Emphasis is on the development of measurement methods for thyristors and rectifier diodes. The major tasks are to evaluate the feasibility of the photovoltaic method and evaluate the use of thermally stimulated current and capacitance measurements.
GRA

N78-10143*# European Space Agency, Noordwikj (Netherlands). Space Science Dept.
THE MULTIPLE APPLICATIONS OF ELECTRONS IN SPACE
Rejean L. Grard *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 203-221 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 09C

N78-10152*# Young (Arthur) and Co., Bethesda, Md. Physics Dept.
PREDICTION OF LARGE NEGATIVE SHADED-SIDE SPACECRAFT POTENTIALS
S. M. L. Prokopenko and J. G. Laframboise *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 369-387 refs (For availability see N78-10129 01-12)
(Grant AF-AFOSR-2962-76)
Avail: NTIS HC A99/MF A01 CSCL 09C

N78-10159*# Pennsylvania State Univ., University Park. Electrical Engineering Dept.
CHARGE DISTRIBUTIONS NEAR METAL-DIELECTRIC INTERFACES BEFORE AND AFTER DIELECTRIC SURFACE FLASHOVER
James W. Robinson *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging-Technol. Conf. 24 Feb. 1977 p 503-717 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 09C

N78-10160*# Toronto Univ. (Ontario). Dept. of Electrical Engineering.
SURFACE MICRO-DISCHARGES ON SPACECRAFT DIELECTRICS
K. G. Balmain, M. Cuchanski, and P. C. Kremer *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 519-526 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 09C

N78-10161*# TRW Defense and Space Systems Group, Redondo Beach, Calif.
SURGE CURRENT AND ELECTRON SWARM TUNNEL TESTS OF THERMAL BLANKET AND GROUND STRAP MATERIALS
D. K. Hoffmaster, G. T. Inouye, and J. M. Sellen, Jr. *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 527-547 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 09C

N78-10162*# Stanford Research Inst., Menlo Park, Calif. Electromagnetic Sciences Lab.
A RUGGED ELECTRON/ION SOURCE FOR SPACECRAFT CHARGING EXPERIMENTS
J. E. Nanevicz and R. C. Adamo *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 549-555 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 09C

N78-10164*# Rome Air Development Center, Hanscom AFB, Mass. Solid State Sciences Div.
RESULTS OF LITERATURE SEARCH ON DIELECTRIC PROPERTIES AND ELECTRON INTERACTION PHENOMENA RELATED TO SPACECRAFT CHARGING
J. A. Wall, E. A. Burke, and A. R. Frederickson *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 569-591 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N78-10401 Brown Univ., Providence, R. I.
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF PRESSURE-SHEAR WAVES IN SOLIDS Ph.D. Thesis
Ahmed Saied Abou-Sayed 1975 111 p
Avail: Univ. Microfilms Order No. 77-14079

An experimental method is described for the study of one dimensional plane waves corresponding to combined pressure and shear. The experiment involved the impact of two skewed flat plates. A projectile plate was accelerated using a gas gun and made to impact a target plate in a vacuum chamber. The projectile and target plates were parallel, but inclined relative to the axis of the gun so that the particle velocity in the target has components both normal and parallel to the plane of impact. The particle velocity at the target rear (free) surface was recorded as a function of time. The normal velocity component was monitored using a laser velocity interferometer; the transverse motion was monitored using a shadow technique. Preliminary experiments were performed using 6061-T6 aluminum projectile plates and fused silica targets. Dissert. Abstr.

N78-10402 California Inst. of Tech., Pasadena.
AN EXPERIMENTAL INVESTIGATION OF MIXING IN TWO-DIMENSIONAL TURBULENT SHEAR FLOWS WITH APPLICATIONS TO DIFFUSION-LIMITED CHEMICAL REACTIONS Ph.D. Thesis
John Konrad 1977 122 p
Avail: Univ. Microfilms Order No. 77-14915

The extent of molecular mixing in several two-dimensional free turbulent shear flows was measured using a concentration probe with a frequency response of 100 kHz and a spatial resolution of 0.1 mm. The flows investigated were; (1) A shear layer in which the gases on either side of the layer are of unequal density; (2) a shear layer in which the gases on either side of the layer are of equal density; and (3) a wake in which the gases on either side of the wake are of unequal densities. The extent of mixing was measured as a function of Reynolds number for the first case. It was found that at a critical Reynolds number the extent of molecular mixing sharply increased (25%). Power spectral density curves of the concentration time histories also indicated a marked increase in the high frequency fluctuations above this Reynolds number. Dissert. Abstr.

N78-10403 Illinois Univ., Urbana-Champaign.
DYNAMIC RESPONSE OF SOME TENTATIVE COMPLIANT SURFACES TO CONVECTED TURBULENCE FIELDS Ph.D. Thesis
Hussein Hasan Nijim 1977 120 p
Avail: Univ. Microfilms Order No. 77-14995

The vibration of periodic structures (structures composed of identical subunits) under boundary layer turbulence excitations and the possibility of using them as compliant surfaces are considered. In particular, two models of periodic structures were investigated: a ribbed membrane backed by a soft material such as polyurethane or PVS plastisol, and a membrane backed by an air cavity. Assuming that the turbulence field is homogeneous and convected as a frozen pattern, a closed-form solution of the structural response was obtained when the structure was infinitely long. Based on this solution, a parametric study was carried out to determine optimal structural designs which have the desired surface motion (under boundary layer turbulence excitations) for drag reduction. Dissert. Abstr.

N78-10404 Georgia Inst. of Tech., Atlanta.
AN INVESTIGATION OF MULTIPLE ORIFICE WALL JETS Ph.D. Thesis
Virgil Kirkland Smith, III 1977 317 p
Avail: Univ. Microfilms Order No. 77-15065

The major areas of investigation were: (1) a geometrically-simple circular orifice wall jet configuration discharging into still air; (2) a circular orifice wall jet incorporating integrational refinements discharging into still air; and (3) the integrated wall jet configuration under a constant-pressure mainstream flow. The growth of the characteristic dimensions of the jet and the decay of the jet velocity are presented for all wall jet studies. In addition, vertical and lateral velocity profile similarity are described. The multiple jet surveys are synthesized and analyzed in order to quantify the flow development. Skin friction laws are demonstrated, and law of the wall descriptions are evaluated for the three dimensional wall jet. Velocity profile and skin friction measurements are presented in tabular form. Dissert. Abstr.

N78-10405 Brown Univ., Providence, R. I.
STRATIFIED SHEAR FLOWS OVER SMALL OBSTACLES IN THE PRESENCE OF A CRITICAL LAYER: THE NONLINEAR BOUNDARY-VALUE PROBLEM Ph.D. Thesis
Stephen Barry Margolis 1976 229 p
Avail: Univ. Microfilms Order No. 77-14163

A steady unperturbed state was assumed far away from the obstacle, and the task was to determine the entire flow field. The existence of a free or rigid upper boundary (or radiation condition in the case of a fluid of infinite depth) and the failure of the linear theory in the critical layer resulted in a nonlinear boundary value problem. For simplicity, attention was mainly confined to the case of steady, two dimensional, inviscid, nonheat conducting, incompressible flows in the presence of gravity. Dissert. Abstr.

N78-10406 Illinois Univ., Urbana-Champaign.
NUMERICAL ANALYSIS OF CONVECTIVE COOLING OF PIPE-TYPE ELECTRIC CABLES Ph.D. Thesis
Shuh-Yi Chern 1977 132 p
Avail: Univ. Microfilms Order No. 77-14936

A numerical analysis was developed to predict friction factors and heat transfer coefficients in pipes with irregular cross sections such as those occurring in underground pipe-type electric cable systems. The method was to find three dimensional temperature and velocity fields in laminar flow for three different cable configurations. The secondary flow generated by natural convection became very important for this system. Thus, the Nusselt number was strongly dependent on Rayleigh number and cable configuration, both of which affect the secondary flow. The analysis employed the finite element method which can be easily applied to irregular geometries and nonuniform meshes. The numerical solutions substantially agreed with experimental results. They show that the Nusselt number increased with increasing the Rayleigh numbers. Dissert. Abstr.

N78-10407 Houston Univ., Tex.
AN APPROXIMATE SOLUTION TO THE BOUNDARY LAYER ENERGY EQUATION WITH RADIANT PARTICIPATING MEDIA Ph.D. Thesis
Mahmoud-Sami Ahmed Douara 1976 123 p
Avail: Univ. Microfilms Order No 77-13631

The problem of simultaneous convection, conduction, and radiation in the laminar boundary layer over a flat plate was formulated and solved. The solution was obtained analytically by means of perturbation theory, and the effect of including the radiation term on both the temperature distribution and the heat flux is presented for various conditions. The case of a steady, laminar, two dimensional flow over a black, isothermal flat plate was considered. In addition, the fluid medium was assumed to be a gray, isotropic, viscous, radiation absorbing-emitting, and thermally conducting perfect gas with most properties independent of the temperature. The nonlinear integral-differential energy

equation was reduced to a simpler form through the use of both the Rosseland and the optically thin approximation for the radiation term. The resulting equations clearly illustrated that the problem may be treated as a singular perturbation problem, if the parameters and/or their product was small. Dissert. Abstr.

N78-10408 Oregon State Univ., Corvallis.
AN EXPERIMENTAL/ANALYTICAL INVESTIGATION OF DEEP SUBMERGED MULTIPLE BUOYANT JETS Ph.D. Thesis
Landis Dee Kannberg 1976 327 p
Avail: Univ. Microfilms Order No. 77-14068

The experimental results include the measured downstream thermal dilution, width, and centerline trajectory of the buoyant thermal plume from multiport jets. Independent parameters for which measurements were obtained include port spacing, discharge Froude Number, discharge angle, and discharge to ambient velocity ratio. The analytical portion of this report employs the lumped differential model of Hirst as modified for merging multiple jets by Davis. The essential features of the analysis are: (1) the gradual transition of the profiles from simple axisymmetric profiles to merging profiles and finally to fully merged, pseudoslot, two-dimensional profiles, and (2) an entrainment based on the available entrainment surface. Dissert. Abstr.

N78-10409 Brown Univ., Providence, R. I.
THE VISCOSITY OF GASEOUS MIXTURES Ph.D. Thesis
Hussein Ezzat Khalifa 1976 135 p
Avail: Univ. Microfilms Order No. 77-14146

The viscosity of the six binary mixtures Ne-CF4, Ar-CF4, N2-CF4, CO2-CF4, CH4-CF4, and CH4-SF6 was measured at 1 atm over a range of compositions and in the temperature ranges 25-400 C for the first four and 25-200 C for the last two. The measurements were performed in a high precision, oscillating disk viscometer. The pure gases He, Ne, Ar, Kr, and N2, whose viscosity is very accurately known, were used for calibrating the viscometer. Moreover, a continuous check on the operation of the viscometer was provided by measuring the viscosity of the pure components of the mixtures at every temperature and comparing it with the accurate values obtained earlier. The analysis of the experimental data was performed in two stages: first disregarding higher-order corrections and secondly taking them into consideration. Dissert. Abstr.

N78-10410 Oregon State Univ., Corvallis.
TEMPERATURE PROFILES, THERMAL DIFFUSION FACTORS, AND MOLECULAR DIFFUSION COEFFICIENTS FOR FLOW-COUPLED DIFFUSION IN A TWO-DIMENSIONAL FLOW FIELD Ph.D. Thesis
Walter William Laity 1977 360 p
Avail: Univ. Microfilms Order No. 77-14069

Temperature fields associated with flow-coupled, binary gaseous diffusion were investigated. Attention was restricted to steady, laminar flow of a gas mixture through a circular duct. An apparatus is described in which gas A (the heavier gas) flows upward through a vertically oriented diffusion tube and gas B (the lighter gas) is injected against the bulk flow. If the velocity of gas A is sufficiently small, gas B will diffuse against the flow and both gases will be present in the region upstream of the injection plane. Thermal diffusion factors and molecular diffusion coefficients based on data taken in the apparatus are presented as a function of gas composition. A model is discussed that was developed for use in predicting the radial and axial temperature distributions associated with flow-coupled diffusion. Dissert. Abstr.

N78-10411*# Sigma Research, Inc., Richland, Wash.
STUDY OF A HIGH PERFORMANCE EVAPORATIVE HEAT TRANSFER SURFACE Final Report
Elric W. Saaski and R. H. Hamasaki 27 May 1977 82 p refs
(Contract NAS2-9120)
(NASA-CR-152008) Avail: NTIS HC A05/MF A01 CSCL 20D

An evaporative surface is described for heat pipes and other two-phase heat transfer applications that consists of a hybrid composition of V-grooves and capillary wicking. Characteristics of the surface include both a high heat transfer coefficient and high heat flux capability relative to conventional open-faced screw thread surfaces. With a groove density of 12.6 cm/1 and ammonia working fluid, heat transfer coefficients in the range of 1 to 2 W/sq cm have been measured along with maximum heat flux densities in excess of 20 W/sq cm. A peak heat transfer coefficient in excess of 2.3 W/sq cm was measured with a 37.8 cm/1 hybrid surface. Author

N78-10412*# Houston Univ., Tex. Dept. of Mechanical Engineering.
ACOUSTICS-TURBULENCE INTERACTION Final Report
A. K. M. F. Hussain and K. B. M. O. Zaman Nov. 1977 122 p refs
(Grant NsG-1290)
(NASA-CR-155178) Avail: NTIS HC A06/MF A01 CSCL 20D

An investigation of the instability frequency was undertaken. Measurements revealed that the hot wire probe induces and sustains stable upstream oscillation of the free shear layer. The characteristics of the free shear layer tone are found to be different from the slit jet wedge edgetone phenomenon. The shear tone induced by a plane wedge in a plane free shear layer was then examined in order to further document the phenomenon. The eigenvalues and eigenfunctions of the tone fundamental show agreement with the spatial stability theory. A comprehensive summary of the results is also included. Author

N78-10413# Weapons Research Establishment, Salisbury (Australia).
IMPROVED INTEGRATION TECHNIQUES FOR FLUID FLOW FINITE ELEMENT FORMULATIONS
C. A. J. Fletcher Apr. 1977 46 p refs
(WRE-TR-1810(W); AR-000-552) Avail: NTIS HC A03/MF A01

Two refinements in the application of numerical integration, alternative sampling points and reduced integration, have been investigated for a Galerkin finite element formulation of a representative flow problem. By sampling the solution at the Gauss points a significant improvement in accuracy is achieved. The accuracy gain is lost if the solution at the Gauss points is extrapolated to the edge of the element. Consideration of a one-dimensional problem suggests that the use of reduced integration is equivalent to fitting the equation residual in the least-squares sense over each element. The employment of reduced integration, rather than exact integration, for incompressible, inviscid flow about a two-dimensional cylinder has produced solutions that are ten times more efficient if quadratic rectangular elements, either Serendipity or Lagrange, are used. The utilization of linear rectangular elements has caused a smaller improvement. The improvements associated with the introduction of reduced integration are independent of grid refinement. The use of reduced integration and triangular elements, with both linear and quadratic shape functions, has produced no significant improvement. The results herein reinforce the previously published conclusion that the quadratic, rectangular, Serendipity element is the most efficient element for flow problems of this type. Author

N78-10414*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ADVANCED SPACECRAFT THERMAL CONTROL TECHNIQUES
Carl H. Fritz Sep. 1977 30 p refs
(NASA-TM-78134) Avail: NTIS HC A03/MF A01 CSCL 20D

The problems of rejecting large amounts of heat from spacecraft were studied. Shuttle Space Laboratory heat rejection uses 1 kW for pumps and fans for every 5 kW (thermal) heat rejection. This is rather inefficient, and for future programs more efficient methods were examined. Two advanced systems were studied and compared to the present pumped-loop system. The advanced concepts are the air-cooled semipassive system, which features rejection of a large percentage of the load through the outer skin, and the heat pipe system, which incorporates heat pipes for every thermal control function. Author

N78-10415*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE DESIGN OF HYDRAULIC PRESSURE REGULATORS THAT ARE STABLE WITHOUT THE USE OF SENSING LINE RESTRICTORS OR FRICTIONAL DAMPERS
Harold Gold 1977 22 p refs Presented at Natl. Conf. on Fluid Power, Chicago, 25-27 Oct. 1977; sponsored by IIT
(NASA-TM-X-73687; E-9220) Avail: NTIS HC A02/MF A01 CSCL 20D

Parameters controlled in design determine the stability of hydraulic pressure regulators in service. The non-linear sensing line restrictor can provide stability, but degrades the transient response. Linear damping is not always physically realizeable and is sensitive to clearance and viscosity. Design relationships are analytically derived through which regulators can be made to be stable without the use of either of these damping means. The analytical distinctions between the parameters derived and those in prior literature are discussed. An analytically derived circuit component that stabilizes an otherwise unstable regulator and its experimental verification is described. Author

N78-10416*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RELEASE OF DISSOLVED NITROGEN FROM WATER DURING DEPRESSURIZATION TRANSIENTS: PRELIMINARY REPORT
Robert J. Simoneau 1977 25 p refs Presented at 5th Water Reactor Safety Res. Inform. Meeting, Gaithersburg, Md., 7-11 Nov. 1977; sponsored by Nucl. Regulatory Comm.
(NASA-TM-73822; E-9411) Avail: NTIS HC A02/MF A01 CSCL 20D

An experiment was run to study depressurization of water containing various concentrations of dissolved nitrogen gas, the primary case being room temperature water saturated with nitrogen at 4 MPa. The experiment had two major components both visual: a static depressurization experiment and a flow through a pressure gradient experiment. In the static depressurization experiment, water which had been bubbled with nitrogen for from 1 to 28 days, was depressurized at from 0.09 to 0.50 MPa/second. The transient was photographed with high speed movies. The pictures showed that the bubble population increased strongly with decreasing depressurization rate and weakly with increased bubble time. The water was always very nearly saturated with nitrogen. Bubbles rarely appeared before the pressured reached P sub zero/2 and in some instances levels of P sub zero/5 would show no bubbles. Flow experiments were performed in two nozzles, an axisymmetric converging-diverging nozzle and a two-dimensional converging nozzle with glass sidewalls. Depressurization rates were roughly 0.5 x 1000 to 1.2 x 1000 MPa/second. Both nozzles exhibited choked flow behavior even at nitrogen concentration levels as low as 4 percent of saturation. Author

N78-10417# Naval Postgraduate School, Monterey, Calif.
FORCES ON ROUGHENED CYLINDERS IN HARMONIC FLOW AT HIGH REYNOLDS NUMBERS M.S. Thesis
Steven R. Evans Sep. 1976 73 p refs
(AD-A041179) Avail: NTIS HC A04/MF A01 CSCL 20/4

The in-line forces acting on sand-roughened circular cylinders immersed in an harmonically oscillating flow have been measured using a U-shaped water tunnel. The drag and the inertia coefficients have been determined through the use of a Fourier analysis. These coefficients were found to depend on the Keulegan-Carpenter number, Reynolds number, and the relative roughness. The results have shown that roughness dramatically increases the transcritical drag coefficient. It is recommended that the experiments be extended to the self-excited hydroelastic oscillations of cylinders in harmonic flows as well as to the problems related to wave slamming. Author (GRA)

N78-10418# California Univ., Berkeley. Dept. of Mechanical Engineering.
THE INFLUENCE OF TWIST ON THE MOTION OF STRAIGHT ELLIPTICAL JETS
D. A. Caulk and P. M. Naghdi Jun. 1977 52 p refs
(Contract N00014-76-C-0474)
(AD-A042249; UCB/AM-77-5) Avail: NTIS HC A04/MF A01 CSCL 20/4

This paper is concerned with a fairly detailed analysis of the motion of a straight elliptical jet of an incompressible, inviscid fluid in which the jet is allowed to twist along its axis. Our study, which includes the effects of gravity and surface tension, utilizes the nonlinear differential equations of the one-dimensional theory of a directed fluid jet. A number of theorems are proved pertaining to the motion of a twisted elliptical jet and some special solutions are obtained which illustrate the influence of twist. Author (GRA)

N78-10419# California Univ., Berkeley. Dept. of Mechanical Engineering.
WATER WAVES IN A NONHOMOGENEOUS INCOMPRESSIBLE FLUID
A. E. Green and P. M. Naghdi Jun. 1977 27 p refs
(Contract N00014-76-C-0474)
(AD-A042250; UCB/AM-77-6) Avail: NTIS HC A03/MF A01 CSCL 20/4

After a brief discussion of some undesirable features of a number of different partial differential equations often employed in the existing literature on water waves, a relatively simple restricted theory is constructed by a direct approach which is particularly suited for applications to problems of fluid sheets. The rest of the paper is concerned with a derivation of a system of nonlinear differential equations (which may include the effects of gravity and surface tension) governing the two-dimensional motion of incompressible inviscid fluids for propagation of fairly long waves in a nonhomogeneous stream of water of variable initial depth, as well as some new results pertaining to hydraulic jumps. The latter includes an additional class of possible solutions not noted previously. Author (GRA)

N78-10420# RAND Corp., Santa Monica, Calif.
ENTRY FLOW IN A HEATED TUBE Interim Report
Lun-Shin Yao Jun. 1977 65 p refs
(Contract DAHC15-73-C-0181; ARPA Order 189-1)
(AD-A042203; R-2111) Avail: NTIS HC A04/MF A01 CSCL 20/4

The asymptotic solution of flow near the entrance of a heated straight pipe is obtained by perturbing the solution of flow in an unheated straight pipe. Two vortices result from motions of fluid particles induced by displacement of the boundary layer. The axial velocity has a concave profile and grows toward a uniform profile downstream. The downward stream caused by displacement of secondary boundary layer forces the axial velocity profile counterclockwise if the flow is from left to right. A favorable pressure gradient is generated on the bottom wall; an unfavorable pressure gradient is induced on the top wall. GRA

N78-10421# Systems Research Labs., Inc., Dayton, Ohio.
FLOW CALIBRATION OF THE LASER TEST SHELTER AIRFLOW DUCT Final Technical Report, Apr. - Sep. 1976
C. N. Eastlake and E. E. Ditmer Dec. 1976 111 p refs
(Contract F33615-76-C-2095)
(AD-A042187; AFAPL-TR-76-103) Avail: NTIS HC A06/MF A01 CSCL 20/4

This report documents an experimental flow field mapping conducted in the airflow duct of the laser/fuels/airflow facility. Velocity distributions throughout the test section and in wall boundary layers were measured and correlated with flight data on typical aircraft boundary layer conditions. Flight conditions are reasonably simulated by the observed airflow, both with and without artificial boundary layer thickening. Author (GRA)

N78-10422# Oklahoma State Univ., Stillwater. Fluid Power Research Center.
MERADCOM/OSU HYDRAULIC SYSTEM RELIABILITY PROGRAM. SECTION 5: HYDRAULIC SYSTEM DIAGNOSTICS. SECTION 6: PUMP CONTAMINANT TOLERANCE VERIFICATION Annual Report, Feb. 1976 - Feb. 1977
Feb. 1977 128 p refs 2 Vol.
(Contract DAAK02-75-C-0137)
(AD-A043678; OSU-FPRC-7-M-3) Avail: NTIS HC A07/MF A01 CSCL 13/7

It is generally agreed that contaminant wear is a major factor in the life and reliability of a hydraulic system. However, there is considerable evidence which suggests that proper component selection and maintenance can produce a significant reduction in the life cycle costs associated with such fluid systems. One of the primary costs related to the operation of a

hydraulic system is premature failure, downtime, and unscheduled maintenance. One method of reducing these factors is through effective system diagnostics and prognosis. This section presents the results, interpretation, and conclusions relative to the effort associated with hydraulic system diagnostics. Specifically, the activity was directed toward the investigation and adaptation of Ferrographic fluid analysis for use with hydraulic systems. Laboratory tests were conducted to gain an appraisal of the capabilities and limitations of the technique and to determine the characteristic patterns of the water debris. The data and interpretation of these tests are presented. In addition, hydraulic system analysis was conducted to assess the ability of the Ferrographic method to pinpoint excessive wear situations. This section presents a detailed account of the project activities in the area of pump contaminant tolerance verification. A brief review of the progress made during the previous year is also given. Results of a number of extended life tests (from 22 to 1430 hours) are presented and comparisons are made to the calculated or predicted values. It is concluded that the contaminant wear prediction techniques are of sufficient accuracy to be routinely applied with confidence. GRA

N78-10423# Oklahoma State Univ., Stillwater. Fluid Power Research Center.

MERADCOM/OSU HYDRAULIC SYSTEM RELIABILITY PROGRAM. SECTION 2: CYLINDER STRUCTURAL INTEGRITY ASSESSMENT. SECTION 3: HYDRAULIC SYSTEM OPERATIONAL SEVERITY ASSESSMENT. SECTION 4: ON-BOARD MONITOR STUDY Annual Report, Feb. 1976 - Feb. 1977

Feb. 1977 194 p refs 2 Vol.
(Contract DAAK02-75-C-0137)
(AD-A043677; OSU-FPRC-7-M-2) Avail: NTIS HC A09/MF A01 CSCL 13/7

This report presents an account of the activities of the MERADCOM-OSU System Reliability Program in the area of hyraulic cylinder structural integrity assessment. A dynamic mathematical model of the locked-rod or impulse testing is developed and the effects of changing test setup parameters are also demonstrated. A computer program for simulating locked-rod testing is presented along with a user's guide. Draft procedures for both stroking (endurance) and locked-rod (impulse) tests are included in an appendix. Results of experimentation with locked-rod setup are also presented. This report presents the data obtained from the On-Board Monitor activities. These data are a result of endeavors on two projects--On-Board Monitor and Operational Severity. STAM units were installed on a variety of vehicles. As many as five parameters per vehicle were monitored with several tests repeated with multiple runs. Author (GRA)

N78-10424# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

BOUNDARY LAYER EFFECTS. PROCEEDINGS OF THE 5TH US AIR FORCE/FEDERAL REPUBLIC OF GERMANY DATA EXCHANGE AGREEMENT MEETING Progress Report, Jun. 1975 - Apr. 1976

Anthony W. Fiore Jul. 1977 511 p refs Proc. held at Wright-Patterson AFB, Ohio, 28-29 Apr. 1976
(AD-A043588; AFFDL-TR-77-61) Avail: NTIS HC A22/MF A01 CSCL 20/4

In 1968 the United States Air Force and the Federal Republic of Germany signed a Data Exchange Agreement numbered AF-68-G-7416 entitled 'Boundary Layer Effects.' The purpose was to exchange data in the area of boundary layer research. It includes both experimental and theoretical boundary layer research at speeds from subsonic to hypersonic in the presence of laminar, transitional, and turbulent boundary layers. The main effort in recent years has been on turbulent boundary layers which are both attached and separated in the presence of such parameters as pressure gradients, wall temperature, surface roughness, etc. The research presented in this report covers the period from June 1975 - April 1976. In the United States the research was conducted in various Departments of Defense Laboratories, N.A.S.A., and private universities. In the Federal Republic of Germany it was carried out within the DFVLR Laboratories, Universities, and industry. Author (GRA)

N78-10425# Naval Postgraduate School, Monterey, Calif.

THE SECOND-ORDER SOLUTION FOR WAVE INTERACTION WITH A SUBMERGERED CYLINDER Final Report, Sep. 1974 - Aug. 1977

C. J. Garrison and G. W. Smith 1 Aug. 1977 95 p refs
(Grant NSF ENG-73-04019)
(AD-A044268; NPS-69GM77081) Avail: NTIS HC A05/MF A01 CSCL 20/4

The second-order solution of the problem of the interaction of a train of regular waves with a completely submerged, horizontal circular cylinder in water of finite depth is presented for two-dimensional flow. The incident wave is developed as a second-order Stokes' wave by use of a perturbation method and the solution of both the first-order and second-order scatter potentials is obtained numerically using the Green's function approach. The hydrodynamic pressure and resulting first-order and second-order force coefficients are determined numerically and presented for various values of water depth, cylinder depth of submergence and wave length. Author (GRA)

N78-10426# Naval Postgraduate School, Monterey, Calif.

FLUID IMPACT FORCES ON CYLINDERS IN HARMONIC FLOW M.S. Thesis

Richard A. Post Jun. 1977 48 p refs
(AD-A044324) Avail: NTIS HC A03/MF A01 CSCL 20/4

The evolution of forces acting on horizontal cylinders subjected to impact by an harmonically oscillating free surface has been investigated both theoretically and experimentally. The experiments were carried out in a large U-shaped water tunnel, with cylinder diameters ranging from 3.0 to 6.5 inches. The results have been expressed in terms of two force coefficients. The first is the slamming coefficient which expresses the normalized force acting on the cylinder at the time of impact; and the second is the maximum drag coefficient which occurs when the cylinder is immersed approximately 1.75 diameters in water. The slamming coefficient was found to be equal to pi, as predicted theoretically. It was also found that the slamming coefficient may be amplified to a value as high as 2 pi through the dynamic response of the cylinder. The maximum of the normalized force in the drag dominated region was found to be approximately equal to 2.0. It decreased with increasing Froude numbers to a value of about unity. It is recommended that further experiments be conducted with sand-roughened cylinders and the dependence of the rate of rise of the impact force on the flow parameters be investigated. Author (GRA)

N78-10427# Massachusetts Inst. of Tech., Oak Ridge, Tenn. School of Chemical Engineering Practice.

DESIGN OF CRYOGENIC HEAT EXCHANGERS FOR A SUPERCONDUCTING MAGNET

W. A. Chrusciel, B. Y. Tao, and S. A. Ventura 26 Oct. 1976 56 p refs
(Contract W-7405-eng-26)
(ORNL/MIT-242) Avail: NTIS HC A04/MF A01

Computer programs were written to design and simulate the behavior of three heat exchangers for cooling supercritical helium to approximately 4.3 k at 4 atm. Helium, at 1, 3, or 5 gm/sec, is cooled by passing it through 0.635-cm-diam copper tubing immersed in a liquid nitrogen bath, through a copper, concentric tube, countercurrent heat exchanger, and then through 0.635-cm copper tubing immersed in a liquid helium bath. The helium then enters a superconducting test magnet and finally passes through the annulus of the countercurrent exchanger before venting to the atmosphere. Several acceptable designs are presented that meet design and space limitations. ERA

N78-10008# Advisory Group for Aerospace Research and Development, Paris (France).

A CRITICAL REVIEW OF HETEROGENEOUS MIXING PROBLEMS

Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 31-41 refs Repr. from Astronaut. Acta (Austria), v. 13, nos. 5-6, 49681 p 453-465 Presented at Intern. Acad. of Astronautics Symp. on Fluid Dyn. of Heterogeneous Multi-Phase Continuous Media, Naples, 3-6 Oct. 1966 (For availability see N78-10005 01-01)
(Contract AF 33(615)-2215; AF Proj. 7064)
Avail: NTIS HC A07/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N78-10428* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
GAS COMPRESSION APPARATUS Patent
Leslie S. Terp, inventor (to NASA) (Garrett Corp., Los Angeles) Issued 4 Oct. 1977 8 p Filed 24 Oct. 1975 Supersedes N76-13496 (14 - 04, p 0459) Sponsored by NASA
(NASA-Case-MSC-14757-1; US-Patent-4,051,877; US-Patent-Appl-SN-625734; US-Patent-Class-141-4; US-Patent-Class-60-560; US-Patent-Class-60-574; US-Patent-Class-141-197; US-Patent-Class-417-225) Avail: US Patent Office CSCL 14B

Apparatus for transferring gas from a first container to a second container of higher pressure was devised. A free-piston compressor having a driving piston and cylinder, and a smaller diameter driven piston and cylinder, comprise the apparatus. A rod member connecting the driving and driven pistons functions for mutual reciprocation in the respective cylinders. A conduit may be provided for supplying gas to the driven cylinder from the first container. Also provided is apparatus for introducing gas to the driving piston, to compress gas by the driven piston for transfer to the second higher pressure container. The system is useful in transferring spacecraft cabin oxygen into higher pressure containers for use in extravehicular activities.
Official Gazette of the U.S. Patent Office

N78-10429* National Aeronautics and Space Administration. Pasadena Office, Calif.
PHOTOELECTRON SPECTROMETER WITH MEANS FOR STABILIZING SAMPLE SURFACE POTENTIAL Patent
Frank J. Grunthaner (JPL) and Blair F. Lewis, inventors (to NASA) (JPL) Issued 4 Oct. 1977 11 p Filed 9 Apr. 1976 Supersedes N76-26450 (14 - 17, p 2189) Sponsored by NASA
(NASA-Case-NPO-13772-1; US-Patent-4,052,614; US-Patent-Appl-SN-675351; US-Patent-Class-250-310; US-Patent-Class-250-398) Avail: US Patent Office CSCL 14B

An improved X-ray photoelectron spectrometer is disclosed, which includes circuit means to determine the surface potential of a sample, e.g., an insulator. The circuit means comprise an electron gun, whose potential is modulated at a preselected frequency above and below a selected potential with respect to the spectrometer common potential, e.g., ground. The beam of electrons is directed to the sample surface. The sample's surface potential is offset by an offset power supply with respect to the spectrometer common potential until the ac current which flows through the sample reaches a peak amplitude. A lock-in amplifier is included to measure the ac current in phase with the modulating frequency. Official Gazette of the U.S. Patent Office

N78-10430 Oregon State Univ., Corvallis.
THE EFFECT OF ULTRA-HIGH PRESSURE ON THE emf OF THERMOCOUPLES Ph.D. Thesis
Stuart Ames Eide 1977 161 p
Avail: Univ. Microfilms Order No. 77-14063

An indirect method which does not require a direct knowledge of the temperature of the pressurized junction was used to investigate the effect of ultra-high pressure on the thermal emf of a chromel/alumel thermocouple. The unknown temperature was written parametrically as a function of a directly measured quantity, the electrical power delivered to the internal furnace. The emf of the pressurized thermocouple was then written as a function of the temperature and a set of unknown coefficients. Combining the two functions to eliminate the unknown junction temperature, the pressurized emf was given as a function of the furnace power. The coefficients of both the temperature-versus-power function and the pressure-corrected emf-versus-temperature function were then obtained simultaneously by performing a nonlinear least-squares fit to the directly measured emf-versus-furnace power data. Dissert. Abstr.

N78-10431 British Broadcasting Corp., Kingswood (England). Engineering Div.
NEW BLOCK-CODES FOR DIGITAL TAPE RECORDING
M. E. Bailey Sep. 1977 21 p refs
(BBC-RD-1977/33) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The theoretical and practical performance of certain digital codes potentially suitable for digital sound and television recording on magnetic tape is described. The adopted criterion of performance is the attainable packing-density of user-data, i.e. source data, consistent with an adequate bit-error rate. Two particular block-codes were found which provided a 20% increase in the user-data packing-density relative to that obtained with the widely used delay modulation (Miller code). Author

N78-10432*# Stanford Univ., Calif. W. W. Hansen Lab. of Physics.
TO PERFORM A GYRO TEST OF GENERAL RELATIVITY IN A SATELLITE AND DEVELOP ASSOCIATED CONTROL TECHNOLOGY Final Report
W. M. Fairbank, C. W. F. Everitt, and D. B. DeBra Jul. 1977 395 p refs Sponsored by NASA
(NASA-CR-154508) Avail: NTIS HC A17/MF A01 CSCL 14B

A satellite configuration having two gyroscopes with axes parallel to the boresight of a telescope and two at right angles to the telescope and approximately parallel and perpendicular to the earth's axis is proposed for measuring geodetic precessions due to the earth's motion about the sun, higher order geodetic terms calculated from the earth's quadrapole mass moment (0.010 arc-sec/year in a 400 nautical mile polar orbit), and deflection by the sun of the starlight signal for the reference telescope. Data from the experiment also contain large periodic signals due to the annual and orbital aberrations of starlight which are useful in providing a built in reference signal of known amplitude for scaling the relativity signals, and should yield a singularly precise measurement of the parallax of the reference star. The development of the gyroscope and its readout system are discussed, as well as signal integration, drag-free control, and attitude control. A.R.H.

N78-10433*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MAGNETIC SUSPENSION AND POINTING SYSTEM Patent Application
Willard W. Anderson and Nelson J. Groom, inventors (to NASA) Filed 17 Jun. 1977 10 p
(NASA-Case-LAR-11889-2; US-Patent-Appl-SN-807703) Avail: NTIS HC A02/MF A01 CSCL 14B

An apparatus is described for providing accurate pointing of instruments on a carrier vehicle and for providing isolation of the instruments from the vehicle's motion disturbances. The apparatus includes two assemblies, with connecting interfaces, each assembly having a separate function. The first assembly is attached to the carrier vehicle and consists of an azimuth gimbal and an elevation gimbal which provide coarse pointing of the instruments by allowing two rotations of the instruments relative to the carrier vehicle. The second or vernier pointing assembly is made up of magnetic suspension and fine pointing actuators, roll motor segments, and an instrument mounting plate around which a continuous annular rim is attached which provides appropriate magnetic circuits for the actuators and the roll motor segments. The vernier pointing assembly is attached to the elevation gimbal and provides vernier attitude fine pointing and roll positioning of the instruments as well as six degree-of-freedom isolation from carrier motion disturbances. NASA

N78-10434*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VARIABLE CONTOUR SECURING SYSTEM Patent Application
Paul P. Zebus (Rockwell International, Downey, Calif.), Cyrus C. Haynie (Rockwell International, Downey, Calif.), and Poley N. Packer, inventors (to NASA) (Rockwell International, Downey, Calif.) Filed 27 Sep. 1977 14 p Sponsored by NASA

(NASA-Case-MSC-16270-1; US-Patent-Appl-SN-837260) Avail: NTIS HC A02/MF A01 CSCL 14B

A vacuum operated holding fixture for securing parts of variable contour is reported. The retaining mechanism includes a spaced array of adjustable spindles mounted on a housing. Each spindle has a base member support cup at one end thereof. A vacuum source is applied to the cups for seating the member adjacent to the cups. A locking mechanism sets the spindles in a predetermined position once the member has been secured to the spindle support cups. NASA

N78-10435*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

LIGHTNING CURRENT DETECTOR Patent Application

Stephen F. Livermore, inventor (to NASA) Filed 22 Sep. 1977 12 p

(NASA-Case-KSC-11057-1; US-Patent-Appl-SN-835544) Avail: NTIS HC A02/MF A01 CSCL 14B

An apparatus is outlined for measuring the intensity of current produced in an elongated electrical conductive member by a lightning strike. The apparatus includes an elongated strip of magnetic material that is carried within an elongated tubular housing. A predetermined electrical signal is recorded along the length of the elongated strip of magnetic material. One end of the magnetic material is positioned closely adjacent to the electrically conductive member so that the magnetic field produced by current flowing through the member disturbs a portion of the recorded electrical signal directly proportional to the intensity of the lightning strike. NASA

N78-10436*# General Dynamics Corp., Chicago, Ill.

REAL TIME DUST FALL MONITOR (RTDFM) Final Report, 1 Dec. 1975 - 1 Oct. 1976

C. R. Claysmith Oct. 1976 47 p

(Contract NAS8-31682)

(NASA-CR-150446) Avail: NTIS HC A03/MF A01 CSCL 14B

A prototype ultraviolet optical instrument designed and developed to monitor 300 level surface cleanliness is described. Size, weight, sensitivity, and simplicity design parameters were satisfied. Tests were conducted with various configurations of the detector array and sample surfaces. Circuit schematics are included. It is shown that output drift is due to effective lamp intensity variations. The instrument is intended to be a part of the integrated environmental contamination monitor of the space shuttle. Author

N78-10437*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.

A PROCEDURE FOR ACCURATE CALIBRATION OF THE ORIENTATION OF THE THREE SENSORS IN A VECTOR MAGNETOMETER Final Report

R. L. McPherron Jun. 1977 107 p refs

(Contract NAS5-23660)

(NASA-CR-156638) Avail: NTIS HC A06/MF A01 CSCL 14B

Procedures are described for the calibration of a vector magnetometer of high absolute accuracy. It is assumed that the calibration will be performed in the magnetic test facility of Goddard Space Flight Center (GSFC). The first main section of the report describes the test equipment and facility calibrations required. The second presents procedures for calibrating individual sensors. The third discusses the calibration of the sensor assembly. In a final section recommendations are made to GSFC for modification of the test facility required to carry out the calibration procedures. Author

N78-10438# Sandia Corp., Livermore, Calif.

RAPID SCAN LASER LINEWIDTH DIAGNOSTIC INSTRUMENT

J. R. Smith Apr. 1977 26 p refs

(Contract EY-76-C-04-0789)

(SAND-77-8215) Avail: NTIS HC A03/MF A01

An instrument consisting of a Fabry-Perot interferometer and a linear diode array is described. The instrument is cabable of resolving linewidths from 1.0 per cm to 0.04 per cm in the 450 nm to 550 nm spectral range. The device is suitable for use with continuous lasers, single-pulse lasers or those with repetition rates up to 1000 pulses per second. Pulsewidths as short as two nanoseconds may be analyzed. ERA

N78-10439# National Bureau of Standards, Washington, D. C.

THE NATIONAL MEASUREMENT SYSTEM FOR FAR ULTRAVIOLET RADIOMETRY Final Report

W. R. Ott Jun. 1977 75 p refs

(PB-269535/1; NBSIR-75-941) Avail: NTIS HC A04/MF A01 CSCL 14B

Contents include: structure of the measurement system; impact, status, and trends of the measurement system; and a survey of NBS services. A summary and conclusions are presented. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N78-10440 Nebraska Univ., Lincoln.

THE FORMATION, PROPAGATION AND STRUCTURE OF LASER SUPPORTED DETONATION WAVES AND THEIR EFFECT ON LASER-TARGET INTERACTIONS Ph.D. Thesis

Michael Richard Stamm 1976 186 p

Avail: Univ. Microfilms Order No. 77-14693

A computer model was used to examine in detail the nonequilibrium structures and propagation mechanisms of laser supported detonation waves, and the heating of a metal target in the presence of a plasma. This model gives laser-induced breakdown times for helium, argon and air which agree well with those obtained by detailed quantum kinetic calculations of gas breakdown over a wide range of laser intensities. The heating of an aluminum target by laser radiation was investigated utilizing an optically thick (but physically thin) plasma introduced at the target surface. Calculations predict that at high laser intensities the initial plasma evolves into a detonation wave which shields the target from laser radiation, while at lower fluxes the plasma relaxes into transparency. Dissert. Abstr.

N78-10441 Columbia Univ., New York.

CORRELATION OF INTENSE ELECTRON BEAM DYNAMICS WITH THE OPERATION OF THE RELATIVISTIC CYCLOTRON MASER Ph.D. Thesis

Samuel Talmadge 1977 98 p

Avail: Univ. Microfilms Order No. 77-14850

The forward directed X-ray radiation pattern of relativistic electrons which collide with a low Z thin target foil was used to determine the transverse momentum of an intense electron beam (550 keV, 10 kA) propagating along a magnetic field. The transverse momentum of the beam electrons is controlled both by a magnetic undulator, consisting of spaced iron rings similar to those used in previous cyclotron maser experiments, and by a carefully wound electromagnet consisting of alternating dipoles. The effect of relative undulator strength, delta B/B, on the beam momentum distribution is determined, together with the total microwave power as measured by a calorimeter. The results, which are interpreted with the aid of a numerical model indicate a positive correlation between perpendicular momentum and radiated power. Dissert. Abstr.

N78-10442 California Univ., San Diego.

LASER DIAGNOSTIC MEASUREMENTS. 1: PARTICLE SIZE DETERMINATION USING THE PHOTOCURRENT POWER SPECTRUM OF LASER RADIATION SCATTERED FROM MOVING, POLYDISPERSE PARTICLE SYSTEMS. 2: ANOMALOUS TRANSPARENCY IN NITROSYL CHLORIDE Ph.D. Thesis

Jay Marshall Bernard 1977 180 p

Avail: Univ. Microfilms Order No. 77-13680

The effects of polydispersity, short observation times, and various experimental configurations are reported. Using the monodisperse (uniform particle size) form of this theory, experimental measurements of the growth of soot particles in ethylene-oxygene flames were made, and compared with size determinations based on the angular distribution of the total scattered signal strength. Measurements based on photocurrent power spectra are preferred for their high spatial resolution and

their independence (in the monodisperse case) of the particle refractive index. The propagation of high peak power laser pulses in an absorbing gas was studied. The theory of self-induced transparency (SIT) is discussed in detail. The best evidence for this are measured pulse envelope propagation velocities as low as c/4.5, indicating that considerable electromagnetic energy was stored by the absorber and subsequently returned to the pulse.
Dissert. Abstr.

N78-10443 Materials Research Labs., Melbourne (Australia).
HIGH-PRESSURE DISCHARGE FOR CO 2 LASERS
R. McLeary and P. J. Beckwith May 1977 16 p refs
(MRL-R-687; AR-000-656) Copyright. Avail: Issuing Activity

The characteristics of continuous electric discharges stabilised by the plasma-injection technique are described. The gases investigated are N2 and mixtures of N2 and CO2 that are suitable for use in CO2 lasers. Discharge characteristics are presented for wide ranges of pressure, discharge length and gas mixture. Stable discharges in N2 have been achieved at power densities up to 200 MW/m3 (200 kW/litre) at atmospheric pressure.
Author

N78-10444 Polish Academy of Sciences, Warsaw.
GENERALIZATION OF THE DESCRIPTION OF ENERGY CONVERSION IN CO2 IMPULSE LASERS [UOGOLNIENIE OPISU KONWERSJI ENERGII W IMPULSOWYCH LASERACH CO2]
Wojciech W. Byszenski 5 Apr. 1977 88 p refs In POLISH
Avail: Issuing Activity

The conversion of electrical energy to laser radiation energy was studied with emphasis on controlled glow discharge in a high pressure mixture of molecular gases, CO2, N2, and H2O. The processes of excitation of modes of oscillations, relaxation of their energy, and forced emission of radiation were analyzed and a simple theoretical model describing energy conversion was developed. The model was generalized so that it applies to the majority of laser types and CO2 impulse amplifiers. Methods of approximate calculation of the coefficients occuring in the equations are given. These coefficients describe the velocity of energy transport to oscillation modes as a result of collisions of the electron-molecule type.
Author

N78-10445*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
A LASER APPARATUS Patent Application
Gerhard A. Koepf, inventor (to NASA) (NAS-NRC) Filed 29 Sep. 1977 19 p Sponsored by NASA
(NASA-Case-GSC-12237-1; US-Patent-Appl-SN-837795) Avail: NTIS HC A02/MF A01 CSCL 20E

A laser apparatus is reported that uses a pump laser device for producing pump laser energy upon being excited. The pump laser device has a resonating cavity for oscillating and amplifying the pump laser energy. A source laser device is energy upon being excited by the pump laser energy, the source laser device having a resonating cavity for oscillating and amplifying the source laser energy. The source laser's resonating cavity is coupled within a portion of the pump laser's resonating cavity.
NASA

N78-10446*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
DUST PARTICLE VELOCITY MEASUREMENT Final Report, Jun. - Nov. 1976
Leroy O. Thielman Oct. 1976 67 p refs
(Contract NAS2-9280)
(NASA-CR-152067; LMSC-D570053) Avail: NTIS HC A04/MF A01 CSCL 20E

A laser Doppler velocimeter was used to measure the velocity distributions for particles entering a vacuum chamber from the atmosphere through calibrated leaks. The relative number of particles per velocity interval was obtained for particulates of three size distributions and two densities passing through six different leak geometries. The velocity range 15 to 320 meters per second was investigated. Peak particle velocities were found to occur in the 15 to 150 meters per second range depending upon type of particle and leak geometry. A small fraction of the particles were found to have velocities in the 150 to 320 meters per second range.
Author

N78-10447# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
TEMPORAL STABILITY OF SINGLE-LINE CW HF CHEMICAL LASER WITH UNSTABLE RESONATOR Interim Report
Eugene B. Turner, Richard A. Chodzko, and Harold Mirels 24 Jun. 1977 22 p refs
(Contract F04701-76-C-0077)
(AD-A042458; TR-0077(2725)-1; SAMSO-TR-77-37) Avail: NTIS HC A02/MF A01 CSCL 20/5

The temporal stability of the output from a single-line CW HF chemical laser with an unstable resonator was investigated experimentally to determine if large-scale output power fluctuations, associated with a 'mode-medium' instability of the type originally postulated by Dreizin and Dykhne, would be observed. Cases where the gain at the resonator inlet was less than or greater than the threshold value were studied. In all cases, the output was found to be stable. For inlet gain less than the threshold value, this result is in accord with the theoretical prediction of Mirels.
GRA

N78-10448# Avco-Everett Research Lab., Everett, Mass.
TEMPERATURE, STRESS AND OPTICAL PHASE DIFFERENCE FOR A WINDOW TRANSMITTING A CW LASER BEAM
J. L. Zar Oct. 1976 24 p refs
(Contract F19628-75-C-0066)
(AD-A042671; AERL-RR-432) Avail: NTIS HC A02/MF A01 CSCL 20/5

A crystal of CVD zinc selenide was placed in the steady 2 kW beam of a 10.6 micron laser. The beam was approximately Gaussian with 1/e radius of 0.24 cm. Fifty frame per second motion pictures were taken of the time dependent optical distortion as observed with He-Ne light and a Mach-Zehnder interferometer. Thirty-one circular fringes originated in 10 seconds. A theoretical solution is derived for the heating rate, rate of development of thermoelastic stress and rate of change of optical path as a function of time, radius, and surface cooling rate. The expressions are obtained in closed form for a Gaussian laser beam and presented in non-dimensional form. The theory is then compared with the experiment. For the first five seconds of heating, there is good agreement. In the next four seconds, the heating rate is higher than calculated and the discussion contains some possible explanations.
Author (GRA)

N78-10449# Avco-Everett Research Lab., Everett, Mass.
METAL VAPOR VISIBLE LASER KINETICS PROGRAM Final Technical Report
D. Trainor, A. Mandl, and H. Hyman Dec. 1976 31 p refs
(Contract N00014-75-C-0061; ARPA Order 1806)
(AD-A042271) Avail: NTIS HC A03/MF A01 CSCL 20/5

Objective: The objective of this program is to investigate experimentally and theoretically the important kinetic rate processes pertinent to the development of a high power metal vapor visible laser. This research consists of three tasks. Each of the tasks are summarized below. Task I - Lower Level Kinetics (Experimental) Objective: The purpose of this task is to identify metal atom systems that allow selective collisional relaxation processes to efficiently quench lower levels of potential or demonstrated laser transitions. The present experimental study is directed to kinetic rate constant measurements for collisional relaxation of low-lying metastable states of lead, copper, and bismuth. Task II - Upper Level Kinetics (Experimental) Objective: The purpose of this task is to determine the efficiency of various quenching gases in deactivating the upper laser level of lead. To be useful, a quenching gas must rapidly relax the lower laser level and slowly relax the upper laser level, i.e. be selective. Accomplishments: The high temperature resonance fluorescence apparatus utilizing DC phase sensitive detection techniques constructed under this contract was used to provide cross-section information on the lead(6p7s) 3P 10 state. This task was completed and results reported in the semi-annual technical report dated February 1976. Task III - Excitation Processes (Theoretical) Objective: The objective of this effort is to calculate electronic impact and quenching cross sections for the upper and lower laser levels of copper. Accomplishments: Important cross sections required for modeling the copper vapor laser were calculated.
GRA

N78-10450# Naval Weapons Center, China Lake, Calif.
SYNTHESIS OF THE LASER DYES, AC2F, AND RELATED COMPOUNDS Research Report, Jul. - Sep. 1976 and Apr. - May 1977
Ronald A. Henry and Peter R. Hammond Jun. 1977 28 p refs
(AD-A042344; NWC-TP-5953) Avail: NTIS HC A03/MF A01 CSCL 20/5

The synthesis of the laser dye, AC2F, which is 2-oxo-6,9-dimethyl-4-trifluoromethyl-6,7,8,9-tetrahydro-2H-pyrano(2,3-b)(1,8)naphthyridine, in nine steps from readily available starting materials is described. AC3F, which is the homologous 6,8,9-trimethyl compound, is made in six steps. Several related azacoumarins and azaquinolones, which fluoresce in the range 393-482 nm in ethanol, have also been prepared. In addition, 2-oxo-6,9-demethyl-8-phenyl-4-trifluoromethyl-6,7,8,9-tetrahydro-2H-pyrano(2,3-b)(1,8)naphthyridine has been made from 7-hydroxy-1,4-dimethyl-2-phenyl-1,2,3,4-tetrahydro-1,8-naphthyridine and sulfonated to furnish a water-soluble fluorescer (473 nm). Author (GRA)

N78-10451# Systems Research Labs., Inc., Dayton, Ohio.
CLOSED-CYCLE RARE-GAS ELECTRICAL DISCHARGE LASER Final Report, 1 Jun. 1973 - 30 Sep. 1976
Robert A. Olson and Dennis F. Grosjean Apr. 1977 180 p refs
(Contract F33615-73-C-4130)
(AD-A042233; SRL-6792-F; AFAPL-TR-77-13) Avail: NTIS HC A09/MF A01 CSCL 20/5

The recently developed technology of high-pressure molecular lasers has been combined with ultrahigh-vacuum technology to develop a fast-flow high-pressure laser system capable of long-duration closed-cycle operation with rare gases. The system has been used to investigate laser media excited by short, fast-rising high-voltage pulses under conditions of high pressure, fast flow, and low-background impurity level. Experimental results of parametric investigations of high-repetition-rate laser performance for Ar-Xe and He-Xe mixtures are given. Ultraviolet photoionization characteristics of molecular lasers are presented. The photoabsorption cross sections and photoionization yields of N,N-dimethylaniline, triethylamine, trimethylamine, and tri-n-propylamine are given and their use as laser seed compounds discussed; nitric oxide is also considered. UV emission spectra of spark sources applicable to CO and CO2 preionized lasers are presented. Author (GRA)

N78-10452# Army Missile Research and Development Command, Redstone Arsenal, Ala.
SPECTROSCOPY OF LASER IRRADIATED MIXTURES OF BORON TRICHLORIDE AND HYDROGEN
G. A. Tanton, H. C. Meyer, and R. I. Greenberg 28 Apr. 1977 16 p refs
(AD-A042200; DRDMI-TR-77-7) Avail: NTIS HC A02/MF A01 CSCL 07/4

Preparation of missile propellants is one of the areas expected to be significantly impacted by laser induced chemistry. The synthesis by laser induced chemistry of specific boron compounds used as ingredients in propellants has been the purpose of our recent investigations. Author (GRA)

N78-10453# Perkin-Elmer Corp., Norwalk, Conn.
INTRINSIC AND THERMAL STRESS MODELING FOR THIN-FILM MULTILAYERS Final Technical Report, May 1976 - May 1977
A. M. Ledger and R. C. Bastien 15 Jun. 1977 67 p refs
(Contract DAAA25-76-C-0410; ARPA Order 3220)
(AD-A042660; PE-13396) Avail: NTIS HC A04/MF A01 CSCL 11/3

The measurement of intrinsic and thermally induced stresses in multilayer dielectric coatings was investigated to improve reliability and durability predictions of thin-film coatings, particularly, those coatings that will be utillized under extreme thermal conditions (e.g., in high-energy laser systems). Principally, the investigation was conducted using thorium tetrafluoride, zinc selenide, and thallium iodide films as antireflection coatings on potassium chloride at 10.6 micrometers. A four-channel stress interferometer system that measures stress levels in single or multilayer films as they are being deposited was fabricated and tested. A new experimental technique was established whereby the stress interferometer system can also be used to compute Young's modulus and the coefficient of thermal expansion for the thin film materials. A computer code was developed that utilizes the experimentally measured values of intrinsic stress, expansion coefficient, and Young's modulus to model stress levels in multilayer coatings when subjected to a changing uniform environment. Author (GRA)

N78-10454# Lincoln Lab., Mass. Inst. of Tech., Lexington.
BASELINE LINK CALCULATION FOR OPTICAL BROADCASTING THROUGH WATER
Robert M. Lerner 2 Jun. 1977 29 p refs Sponsored in part by Navy
(Contract F19628-76-C-0002)
(AD-A042569; TN-1977-28; ESD-TR-77-117) Avail: NTIS HC A03/MF A01 CSCL 17/2

A link calculation is carried out to determine whether present blue-green technology can support wide-area broadcasting from satellite to oceanic underwater receivers at bit-per-second rates; and to determine what improvements, beyond the status of technology assumed, would be most productive at making such broadcasting possible. The link technology today is tens of dB away from supporting a wide-area broadcast service; the most productive direction for developmental technology is in producing a suitable, efficient laser source with one hundred watts or more of average power output. Author (GRA)

N78-10455# Texas Instruments, Inc., Dallas. Semiconductor Group.
FIBER-OPTIC-COUPLED LOC INJECTION-LASER ARRAY FOR 8500 ANGSTROMS ROOM-TEMPERATURE EMISSION Final Report
David L. Carr and Friedrich H. Doerbeck Dec. 1972 42 p refs
(Contract DAAK02-72-C-0257)
(AD-A042490; TI-03-72-159) Avail: NTIS HC A03/MF A01 CSCL 20/5

The Grasp program is a computer simulation approach to solving problems in which the failure and end of repair events are modeled according to the probability laws of the individual components of the system. The modeling philosophy of Grasp (and Gerts) is that reliability configurations can be represented as network diagrams on which the parameters and logical relationships are specified. This network then is easily converted into a set of data cards. No programming is required. A notation that is an extension of block diagrams commonly used in reliability work, is presented. From these diagrams, the preparation of equivalent Grasp networks is a straightforward process. Grasp is a collection of Ansi FORTRAN subprograms, and the user is required to have only a FORTRAN compiler, a line printer, and disk storage. GRA

N78-10456# Texas Univ., Austin. Biomedical Engineering Lab.
MEASUREMENTS IN THE LASER IRRADIATED EYE DEVELOPMENT OF MICROSENSORS Final Report, 1 Apr. 1976 - 31 Mar. 1977
A. J. Welch and L. D. Forster 1 May 1977 36 p refs
(Contract F44620-76-C-0086)
(AD-A042489; AFOSR-77-0872TR; BME-127-77) Avail: NTIS HC A03/MF A01 CSCL 06/2

Micro fiber optics and combination sensors have been fabricated which can measure light distribution, temperature, and electrical activity in the in vivo ocular fundus. These sensors have been tested in the rabbit and monkey eye. Author (GRA)

N78-10457# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
COPPER HALIDE LASER RESEARCH Final Report
C. S. Liu, D. W. Feldman, J. L. Pack, and L. A. Weaver 31 Mar. 1977 42 p refs
(Contract N00014-74-C-0445)
(AD-A042484) Avail: NTIS HC A03/MF A01 CSCL 20/5

This report describes results of experimental studies of copper halide laser systems. The properties of double-pulse and multipulse copper halide laser systems have been established. Both pulser and laser tube designs have demonstrated reliable operation

under high power, high prf operation: pulser lifetimes of 300 hours and laser tube lifetimes of 100 hours without failure have been recorded for self-heated, high power operation. Laser tubes of various sizes were tested for high energy per pulse operation; the results indicated that high energy operation is presently inhibited by discharge stability problems which occurred in scaled-up laser tubes, and that optimum prf for multipulse excitation does not vary with tube diameter over the range studied. GRA

N78-10458# Rockwell International Corp., Anaheim, Calif.
INVESTIGATION OF SURFACE OPTICAL WAVES FOR OPTICAL SIGNAL PROCESSING Final Technical Report, 1 Jun. 1974 - 1 Jun. 1977
J. D. McMullen and D. L. Mills (Calif. Univ., Irvine) 1 Jun. 1977 136 p refs
(Contract DAHC04-74-C-0024)
(AD-A042530; C77-464/501; ARO-12120.9-P) Avail: NTIS HC A07/MF A01 CSCL 17/9

Propagation and temporal compression of frequency-chirped CO2 laser pulses has been investigated, wherein a dispersive optical pulse delay line is formed using dispersive surface and bulk phonon-polariton propagation modes in solids. Criteria are developed for the compression of optical pulses, and these criteria are compared to the relevant group-dispersive properties of the propagation modes to determine their suitabilities for performing laser pulse compression. Absorption in the infrared-active medium has been shown to limit the magnitude of group dispersion available, in addition to limiting the attenuation length of each propagation mode. For the materials considered, absorption limits the application of this approach to CO2 laser pulses having initial widths of 10 psec or smaller with initial chirp bandwidths in the THz range, if attenuation by absorption is to be limited to 50 db. Both the narrow pulse width and large chirp bandwidth requirements preclude experimental demonstration with present CO2 laser technology. GRA

N78-10459# Air Force Weapons Lab., Kirtland AFB, N. Mex.
EFFECT OF SUPERPOLISHING ON LASER DAMAGE THRESHOLD Final Report
Richard A. House, II Jun. 1977 23 p refs
(AD-A042975; AFWL-TR-76-302) Avail: NTIS HC A02/MF A01 CSCL 20/5

The results of an experimental study to determine the effect of superpolishing techniques on laser induced surface damage are reported. Reduction of surface roughness in five transparent window materials was accomplished using ion polishing and bowl-feed polishing. Surface damage thresholds for these materials were measured at 1.06 micrometers wavelength and 40.5 nsec pulse width. Comparison of the results was accomplished using the recently determined method of roughness normalization. The ion polished samples had greatly improved thresholds, while surface contamination caused a large threshold reduction in the bowl-feed polished samples. Ion polishing was found to be effective in removing surface contamination. Author (GRA)

N78-10460# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
A REVIEW OF RATE COEFFICIENTS IN THE D2-F2 CHEMICAL LASER SYSTEM Interim Report
Norman Cohen 5 Aug. 1977 55 p refs
(Contract F04701-76-C-0077)
(AD-A043812; TR-0077(2603)-3; SAMSO-TR-77-152) Avail: NTIS HC A04/MF A01 CSCL 20/5

The literature pertaining to the chemical kinetics of the deuterium-fluorine chemical laser system is critically reviewed and data are evaluated. A set of best values of all rate coefficient is recommended for modeling and computer calculations. Where experimental data are lacking, estimates are made on the basis of current theoretical techniques or data for analogous kinetic processes. Author (GRA)

N78-10461# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
SIMPLE MODEL OF A CHAIN-REACTION PULSED HF LASER Interim Report
Ronald L. Kerber and James S. Whittier 29 Jul. 1977 42 p refs Prepared in cooperation with Michigan State Univ., East Lansing
(Contract F04701-76-C-0077)
(AD-A043319; TR-0077(2940)-3; SAMSO-TR-77-154) Avail: NTIS HC A03/MF A01 CSCL 20/5

With economical, yet accurate, predictions of pulsed H2 - F2 laser performance as a goal, a rate equation model is formulated that includes only the dominant kinetic mechanisms in the active medium. Effects of model assumptions are examined, and predictions of pulse characteristics are compared with results from a more comprehensive model presented in an earlier study. Computing costs for the present are less than 1% of those for the comprehensive model; moreover, the present model yields laser pulse characteristics that are consistent with experiment and in excellent agreement with the more comprehensive model. In order to illustrate the model's capability, the effects of initial gas mixture composition and cavity threshold on laser performance are studied over the regime of practical interest. Some possible extensions and applications of the model are also discussed. Author (GRA)

N78-10462# Naval Ocean Systems Center, San Diego, Calif.
AN INTERNAL PHONON THEORY FOR THE THERMAL DEPENDENCE OF LINEWIDTH IN Nd(+3) YAG
G. C. Mooradian 25 Apr. 1977 57 p refs
(XF54545033)
(AD-A043393; NOSC/TR-109) Avail: NTIS HC A04/MF A01 CSCL 20/5

Since nonradiative processes affect such critical parameters in solid-state laser operations as linewidth of optical transitions and energy-level exchange, an understanding of the coupling between radiative and nonradiative processes is important. This document reports upon one aspect of this interaction by developing an internal phonon theory for the thermal dependence of linewidth in Nd(+3) YAG. GRA

N78-10463# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
SENSITIVE F2 ABSORPTION DIAGNOSTIC Interim Report
Donald J. Spencer 15 Aug. 1977 27 p refs
(AD-A044245; TR-0077(2610)-3; SAMSO-TR-77-191) Avail: NTIS HC A03/MF A01 CSCL 20/5

A sensitive F2 absorption diagnostic technique was developed by which a difference in absorption sensitivity of delta I/I sub-0 = 0.0001 can determined. This value corresponds to an F2 pressure path length product of 0.215 Torr cm at 300 K. The method was applied to an HF(DF) chemical laser flow and resulted in measured average nozzle-exit values of from 0.4 to 0.5 from a totally dissociated plenum, indicating a large degree of nozzle wall recombination. Author (GRA)

N78-10464# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
PROGRESS IN THE STUDY OF COLLISIONAL QUENCHING OF DF(v > OR = 8) BY USE OF A LARGE FLOW TUBE Interim Report
M. A. Kwok 18 Aug. 1977 15 p refs
(Contract F04701-76-C-0077)
(AD-A044236; TR-0077(2603)-4; SAMSO-TR-77-159) Avail: NTIS HC A02/MF A01 CSCL 20/5

An approach to studying collisional quenching rate coefficients K sub M(v) of very high vibrational levels of DF(v) for several chaperones M is reported. Typically, M = HF, DF, CO2. Some of the physics represented by K sub M(v) are discussed by relating k sub M(v) to a summation involving the cross sections of energy transfer. GRA

N78-10465# Mathematical Sciences Northwest, Inc., Bellevue, Wash.
RARE GAS MONOHALIDE DISCHARGE STUDIES
Dec. 1976 32 p refs
(Contract W-7405-eng-48)
(UCRL-13713; MSNW-76-1053-1) Avail: NTIS HC A03/MF A01

Results of the first phase of an experimental investigation of the minimum e-beam current density requirements for repetitively pulsed XeF lasers with 10 to 100-mJ pulse energy

are presented. Measurements were made in the self-sustained and e-beam preionized mode of operation. The e-beam preionized experimental results were similar to those obtained with UV preionization at other laboratories, indicating that ionization phenomena (rather than photodissociation) are dominant in both experiments. Multi-pulse e-beam experiments in a single gas fill resulted in rapid gas degradation, possibly due to electron bombardment of insulated surfaces with subsequent evolution of gaseous impurities. ERA

N78-10466# Sandia Labs., Albuquerque, N. Mex.
LASER VELOCIMETRY MEASUREMENTS IN THE CAVITY OF HF CHEMICAL LASER (CAVITY INJECTOR TYPE CL-2)
Colin E. Hackett Feb. 1977 194 p refs
(Contract EY-76-C-04-0789)
(SAND-76-9314) Avail: NTIS HC A09/MF A01

Efforts to develop a non-invasive optical technique that permits measurement of gas/particle velocity distributions within the actual lasing zone of an HF chemical laser device are summarized. Data were obtained using a scanning Fourier Transform laser velocimeter system to measure the velocity of TiO2 particles formed by a chemical condensation technique inside the mixing layers between the cavity injector elements. Both velocity probability distributions and the first four statistical moments of the particle velocity distribution at various locations within the intranozzle mixing layers were obtained. The spatial resolution is not small enough to study the fine-scale structure of the gas-mixing regions. The measured bimodal particle velocity probability distributions are ambiguous, either because the gas dynamics of the flow itself is unsteady, or the gas-particle kinematics exhibit features that indicate unmixed conditions in the intranozzle shear flow. ERA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N78-10467* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OIL COOLING SYSTEM FOR A GAS TURBINE ENGINE Patent
George A. Coffinberry (GE, Cincinnati) and Howard B. Kast, inventors (to NASA) (GE, Cincinnati) Issued 16 Aug. 1977 10 p Filed 17 Jul. 1975 Sponsored by NASA
(NASA-Case-LEW-12321-1; US-Patent-4,041,697; US-Patent-Appl-SN-596641; US-Patent-Class-60-39.28R; US-Patent-Class-60-39.66; US-Patent-Class-415-180; US-Patent-Class-123-41.33; US-Patent-Class-123-122E; US-Patent-Class-137-104) Avail: US Patent Office CSCL 21E

A gas turbine engine fuel delivery and control system is provided with means to recirculate all fuel in excess of fuel control requirements back to aircraft fuel tank, thereby increasing the fuel pump heat sink and decreasing the pump temperature rise without the addition of valving other than that normally employed. A fuel/oil heat exchanger and associated circuitry is provided to maintain the hot engine oil in heat exchange relationship with the cool engine fuel. Where anti-icing of the fuel filter is required, means are provided to maintain the fuel temperature entering the filter at or above a minimum level to prevent freezing thereof. Fluid circuitry is provided to route hot engine oil through a plurality of heat exchangers disposed within the system to provide for selective cooling of the oil.
Official Gazette of the U.S. Patent Office

N78-10468* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPACT ABSORBING BLADE MOUNTS FOR VARIABLE PITCH BLADES Patent
Richard Ravenhall (GE, Cincinnati), Charles T. Salemme (GE, Cincinnati), and Arthur P. Adamson, inventors (to NASA) (GE, Cincinnati) Issued 13 Sep. 1977 6 p Filed 29 May 1975 Sponsored by NASA
(NASA-Case-LEW-12313-1; US-Patent-4,047,840; US-Patent-Appl-SN-581751; US-Patent-Class-416-135; US-Patent-Class-416-141; US-Patent-Class-416-220R; US-Patent-Class-416-248) Avail: US Patent Office CSCL 13I

A variable pitch blade and blade mount are reported that are suitable for propellers, fans and the like and which have improved impact resistance. Composite fan blades and blade mounting arrangements permit the blades to pivot relative to a turbine hub about an axis generally parallel to the centerline of the engine upon impact of a large foreign object, such as a bird. Centrifugal force recovery becomes the principal energy absorbing mechanism and a blade having improved impact strength is obtained. Official Gazette of the U.S. Patent Office

N78-10469 Georgia Inst. of Tech., Atlanta.
INVESTIGATION OF SOME TEMPERATURE-RELATED PHENOMENA IN ELASTOHYDRODYNAMIC CONTACTS INCLUDING SURFACE ROUGHNESS EFFECTS Ph.D. Thesis
Holavanahally S. Nagaraj 1976 310 p
Avail: Univ. Microfilms Order No. 77-14579

A technique for measuring the ball surface and fluid film temperatures in an elastohydrodynamic contact was developed. This technique is then used to determine temperatures at peak Hertz pressures from 0.52 GPa (75,500 psi) to 2.03 GPa (294,000 psi) for sliding speeds ranging from 0.02 m/s to 12.7 m/s including varying amounts of rolling. The measured temperatures are compared with values predicted using Blok-Jaeger-Archard surface flash temperature theory. Effects of surface roughness as they influence the surface temperatures are explored using rough balls. Finally, high frequency temperature fluctuations emanating from the interacting asperities are measured and used to predict the onset of severe asperity interactions. A digital frequency analysis of surface profiles before and after running is also performed and correlations with temperature fluctuations are made. Dissert. Abstr.

N78-10470 Connecticut Univ., Storrs.
A METHOD FOR THE SELECTION OF METAL CUTTING VARIABLES USING A MACHINING STATE DESCRIPTION Ph.D. Thesis
Roger Stewart Pressman 1977 202 p
Avail: Univ. Microfilms Order No. 77-14494

The machining state-space is evaluated using heuristic search techniques to determine the combination of metal cutting variables that result in a state description which closely approximates the goal. The initial set of metal cutting variables is altered using a parameter variance procedure that is guided by the results of an evaluation function. The generalized machining state concept is presented, and a prototype system for the turning of carbon steels is developed. Prototype test results indicate that (1) the search technique will converge to the goal state if the goal is attainable, and (2) convergence is rapid when successful and fails when two or more machinability characteristics make conflicting requirements on metal cutting variables. A comparison with other predictive methods shows good qualitative agreement. Dissert. Abstr.

N78-10471*# Rensselaer Polytechnic Inst., Troy, N. Y. School of Engineering.
DESIGN AND EVALUATION OF A TOROIDAL WHEEL FOR PLANETARY ROVERS
Joseph Koskol and Stephen Yerazunis Oct. 1977 97 p refs (Grant NGL-33-018-081)
(NASA-CR-155202; RPI-TR-MP-53) Avail: NTIS HC A05/MF A01 CSCL 13I

The inverted toroidal wheel concept was perceived, mathematically quantified, and experimentally verified. The wheel design has a number of important characteristics, namely; (1) the low footprint pressures required for Mars exploration (0.5 to 1.0 psi); (2) high vehicle weight to wheel weight ratios capable of exceeding 10:1; (3) extremely long cyclic endurances tending towards infinite life; and (4) simplicity of design. The concept, in combination with appropriate materials such as titanium or composites, provides a planetary roving vehicle with a very high degree of exploratory mobility, a substantial savings in weight and a high assurity of mission success. Design equations and computation procedures necessary to formulate an inverted wheel are described in detail. Author

N78-10472*# Chrysler Corp., Detroit, Mich.
SPLITTER-BLADED CENTRIFUGAL COMPRESSOR IMPELLER DESIGNED FOR AUTOMOTIVE GAS TURBINE APPLICATION Final Report, 1 Sep. 1976 - 30 Jun. 1977
R. C. Pampreen Jun. 1977 44 p refs
(Contract NAS3-20059)
(NASA-CR-135237) Avail: NTIS HC A03/MF A01 CSCL 21A

Mechanical design and fabrication of two splitter-bladed centrifugal compressor impellers were completed for rig testing at NASA Lewis Research Center. These impellers were designed for automotive gas turbine application. The mechanical design was based on NASA specifications for blade-shape and flowpath configurations. The contractor made engineering drawings and performed calculations for mass and center-of-gravity, for stress and vibration analyses, and for shaft critical speed analysis. One impeller was machined to print; the other had a blade height and exit radius of 2.54 mm larger than print dimensions. Author

N78-10473*# Southwest Research Inst., San Antonio, Tex.
INVESTIGATION OF THREADED FASTENER STRUCTURAL INTEGRITY Final Report
Oct. 1977 206 p refs
(Contract NAS9-15140; SwRI Proj. 15-4665)
(NASA-CR-151541) Avail: NTIS HC A10/MF A01 CSCL 13E

Technical nondestructive evaluation approaches to the determination of fastener integrity were assessed. Existing instruments and methods used to measure stress or strain were examined, with particular interest in fastener shank stress. Industry procedures being followed were evaluated to establish fastener integrity criteria. Author

N78-10474*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STABILITY OF NUMERICAL INTEGRATION TECHNIQUES FOR TRANSIENT ROTOR DYNAMICS
Albert F. Kascak 1977 22 p refs
(NASA-TP-1092; E-9252) Avail: NTIS HC A02/MF A01 CSCL 21E

A finite element model of a rotor bearing system was analyzed to determine the stability limits of the forward, backward, and centered Euler; Runge-Kutta; Milne; and Adams numerical integration techniques. The analysis concludes that the highest frequency mode determines the maximum time step for a stable solution. Thus, the number of mass elements should be minimized. Increasing the damping can sometimes cause numerical instability. For a uniform shaft, with 10 mass elements, operating at approximately the first critical speed, the maximum time step for the Runge-Kutta, Milne, and Adams methods is that which corresponds to approximately 1 degree of shaft movement. This is independent of rotor dimensions. Author

N78-10475# Teledyne CAE, Toledo, Ohio.
ADVANCED SMALL AXIAL TURBINE TECHNOLOGY Final Report, Jul. 1972 - Jun. 1976
H. F. Due, Jr., C. Rogo, C. L. Kosier, and G. B. Jasas May 1977 332 p refs
(Contract DAAJ02-72-C-0117; DA Proj. 1G1-62207-AA-71) (AD-A042517; TCAE-1508; USAAMRDL-TR-77-1) Avail: NTIS HC A15/MF A01 CSCL 21/5

The objective of the program was to provide the advanced technolgoy small axial-flow turbine designer with empirically derived techniques to improve the accuracy of predicting losses, flow condition, velocity triangles and design point matching. The techniques addressed practical mechanical constraints typical of small, highly loaded cooled turbines, such as: (1) cooling system type and injection method or location, (2) blade fabrication, (3) wall thickness and tolerances, (4) engine integration requirements, (5) life, and (6) maintainability. An advanced turboshaft gas generator application established a realistic turbine environment. For the particular turbine application chosen, experimental data have been obtained for the effects of meridional nozzle constriction, inlet boundary layer, inlet velocity gradients, turbulence intensity, nozzle and rotor cooling, rotor-to-nozzle spacing, nozzle and rotor solidity and Mach number effects. Correlations were obtained and differences between cascade and full-stage test data established. An aerodynamic modeling system was formulated and verified, resulting in an improved turbine design. GRA

N78-10476# SKF Industries, Inc., King of Prussia, Pa.
EXPANSION AND IMPROVEMENT OF SKF COMPUTER PROGRAM SHABERTH. A COMPUTER PROGRAM SHABERTH STEADY STATE AND TRANSIENT THERMAL ANALYSIS OF A SHAFT BEARING SYSTEM Final Report, Feb. - Sep. 1976
W. J. Crecelius, J. X. Liu, and J. Pirvics Oct. 1976 92 p refs
(Contract F33615-76-C-2061; MIPR-M52376-3-000007)
(AD-A042232; SKF-AL76P032; AFAPL-TR-76-89) Avail: NTIS MF A01 CSCL 13/9

This report contains documentation of the enhancements made to SKF Computer Program SHABERTH, an analytical computer program for the study of steady state and transient thermal performance of rolling element bearings and flexible shaft systems. The full friction solution for ball and roller bearings subjected to general axial, radial and moment loading was implemented. Provision was made to include the affects of user specified ring and rolling element material properties. Nonlinear equation solution schemes were examined. The scheme within SHABERTH was tested and improved. SHABERTH was used to model the performance of two distinct shaft bearing systems using optional levels of complexity. Results from the analyses are presented. Author (GRA)

N78-10477# Air Force Systems Command, Wright-Patterson AFB, Ohio.
PRESUMABLE MECHANISM OF THE FORMATION OF A DIFFUSION JOINT OF BONDED METALS OF A HIGH AFFINITY TO OXYGEN
W. Karlinski 14 Feb. 1977 27 p Transl. into ENGLISH from Pr. Inst. Lotnictwa (Poland), no. 2, 1973 p 87-99
(AD-A044153) Avail: NTIS HC A03/MF A01 CSCL 13/5

The tests conducted on the diffusion bonding of 1H18N9T and 2H13 steels, alloys E1437B and Armco iron in an oxidized state, as well as the thermodynamic analysis of the interoxide reactions taking place showed that a diffusion joint forms either as the result of the chemical reactions between oxides, or on account of the mutual disintegration of the oxides and production of solid oxidizing solutions in the zone of joining. The proposed hypothesis explains why a joint cannot be obtained during diffusion bonding of austentitic steels and nimonic type of alloys without an interlayer, explains the mechanism of joint development by using an interlayer of material having a great affinity to oxygen, for example nickel or cobalt, and gives a new criterium for selecting metal for the interlayer. In light of this hypothesis it appears that the use of a high vacuum in bonding oxidizing alloys is pointless, since a vacuum or protective atmosphere can only prevent further oxidation of the distribution surface of bonded metals at the time of their joining, so that interoxide reactions could take place. This affords the possibility of simplifying the technology in the majority of the uses of diffusion bonding with the exception of vacuum-tight joints or the joining of oxygen-free metals since this introduction of oxides or a solid solution of oxygen into a joint is inadmissable. In these cases bonded surface should be metallicly pure. Author (GRA)

N78-10478# Columbia Univ., New York. Lubrication Research Lab.
EXPERIMENTAL INVESTIGATION OF GAS BEARINGS WITH ULTRA-THIN FILMS
Aron Sereny and Vittorio Castelli 7 Jun. 1977 131 p refs (Contract N00014-75-C-0552)
(AD-A043917) Avail: NTIS HC A07/MF A01 CSCL 13/9

The experimental investigation described here involves the highly accurate measurement of bearing clearances on the order of 10 microinches in self-acting pivoted narrow-slider gas bearings. The experimental measurements are based on light interferometry using a variable-wavelength pulsed dye laser and a CW HeNe laser as monochromatic sources. The light interference in the gas bearing is obtained by flying the slider on a very precise optically flat quartz disk through which the light beam is transmitted. The combined effect of high Knudsen numbers and surface irregularities on the flying height of narrow gas bearings is observed by varying the load on the bearing and the ambient molecular mean free path. The experimentally measured bearing

clearances are compared quantitatively with rather accurate theoretical predictions obtained by numerical solution of Reynolds differential equation for compressible fluids with slip boundary conditions. The result of this study indicates that, as clearances in narrow gas bearings get progressively smaller, while the Knudsen number increases to values beyond 0.1, the theoretical model fails to predict the bearing behavior. It is also argued that this failure is because of the weakness of the continuum model. Author (GRA)

N78-10479# Mechanical Technology, Inc., Latham, N. Y.
GAS LUBRICATION RESEARCH FOR 1900 F NON-ISOTHERMAL OPERATION Semiannual Progress Report, 1 Mar. - 1 Sep. 1968
D. Wilson 7 Oct. 1968 52 p refs
(Contract AF 33(615)-3235)
(AD-A044232; MTI-68TR64; SAPR-3) Avail: NTIS HC A04/MF A01 CSCL 13/9

Experiments were conducted on herringbone-grooved hydrodynamic journal bearings and spiral-grooved hydrodynamic thrust bearings under non-isothermal operating conditions. Journal bearing performance was determined under thermal gradients to 120 F/inch axially, 160 F/inch radially, and 133 F/pi radians circumferentially. Under these conditions, bearing characteristics could be predicted within ten percent using the effective average bearing clearance. A double-acting hydrodynamic thrust bearing was evaluated with thermally induced gradients to 67 F/inch radially, 240 F/inch axially and 60 F pi radians circumferentially. The effective bearing axial clearance after accounting for bearing distortions as determined from statically measured axial end play readings agreed within five percent of the clearance required to predict the measured dynamic characteristics. Author (GRA)

N78-10480# Naval Postgraduate School, Monterey, Calif.
A THEORY FOR CAVITATION IN IMPELLERS Final Report
C. J. Garrison Jul. 1977 36 p refs
(AD-A044395; NPS-69GM77082) Avail: NTIS HC A03/MF A01 CSCL 20/4

An approximate theory for cavitation in pump impellers is developed on the basis of a one-dimensional potential flow model. The theory incorporates the unsteady term occurring in Bernoulli's equation and accounts for blockage effects due to vane thickness. A comparison of the theoretical results with experimental data from mixed flow impeller tests shows good agreement near the condition of zero incidence. On the basis of the theoretical results a mechanism of cavitation breakdown is proposed.
Author (GRA)

N78-10481# Oak Ridge Y-12 Plant, Tenn.
IMPROVED TECHNOLOGY FOR CERAMIC ENGINE COMPONENTS Progress Report, Dec. 1976
W. E. Steinkamp and H. P. Wayland, Jr. 3 Mar. 1977 18 p refs
(Contract W-7405-eng-26)
(Y/DA-7107) Avail: NTIS HC A02/MF A01

Hot-pressing techniques and concepts were evaluated; the primary objective was to develop methods to economically form fully dense hardware to shape and/or contour, thereby minimizing machining requirements. To make the hot-pressed shapes more reproducible, a pre-form die was designed and fabricated. Two sets of hot-pressed shapes were fabricated using preformed bodies. Again contour and finish were within tolerance limits. Contour relationship was still askew, but better controlled. Initial powder distribution remains the most significant problem area. Five additional silicon nitride powders from various vendors were analyzed. The pressability of each was evaluated using a 5 wt. percent MgO addition. All were pressed to full density with some minor variations observed in their pressing characteristics. Analysis and characterization of hot-pressed material obtained previously were completed. ERA

N78-10482# European Space Research and Technology Center, Noordwijk (Netherlands). Product Assurance Div.
TESTING THE PEEL OR PULL-OFF STRENGTH OF COATINGS AND FINISHES BY MEANS OF PRESSURE-SENSITIVE TAPES
Paris ESA 1 Sep. 1975 18 p
(ESA-PSS-18/QRM-13T-Issue-1) Avail: NTIS HC A02/MF A01

A mechanical test method was designed to assess the suitability of coatings and other thin materials for use inside or on the surfaces of spacecraft. The comparative peel or pull-off strengths of coatings and the like are determined by testing specimens or intended flight hardware of standard shape under defined conditions of preparation, temperature, and speed of testing. Author (ESA)

N78-10483# AiResearch Mfg. Co., Torrance, Calif.
ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER. VOLUME 1: PROGRAM DESCRIPTION AND TEST SUMMARY Final Report, May 1974 - Jan. 1975
William T. Curran May 1977 138 p
(Contract DOT-TSC-838)
(PB-269400/8; DOT-TSC-UMTA-77-6-1;
UMTA-MA-06-0025-77-2) Avail: NTIS HC A07/MF A01 CSCL 13F

Tests were conducted to demonstrate the principles and feasibility of an energy storage type propulsion system, and its adaptability to an existing car design. The program comprised four phases of tests: (1) verification of safe arrival; (2) debugging procedures; (3) performance verification tests; and (4) expanded test program. Test data collected during the performance verification and expanded test program phases are presented.
GRA

N78-10484# AiResearch Mfg. Co., Torrance, Calif.
ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER. VOLUME 2: PERFORMANCE POWER CONSUMPTION AND RADIO FREQUENCY INTERFERENCE TESTS Final Report, May 1974 - Jan. 1975
William T. Curran May 1977 112 p
(Contract DOT-TSC-838-2)
(PB-269401/6; DOT-TSC-UMTA-77-6-2) Avail: NTIS HC A06/MF A01; HC also available in set of 4 reports as PB-269399-SET HC E10 CSCL 13F

The principles and feasibility of an energy-storage-type propulsion system and its adaptability to an existing car design were demonstrated in four phases of tests on two New York City Transit Authority R-32 cars where propulsion system was replaced by an energy storage system. The four test phases were: verification of safe arrival, debugging procedures, performance verification tests, and expanded test program. Test data collected during the performance verification and expanded test program phases are presented. GRA

N78-10485# AiResearch Mfg. Co., Torrance, Calif.
ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TEST CENTER. VOLUME 3: NOISE TESTS Final Report, May 1974 - Jan. 1975
William T. Curran May 1977 91 p
(Contract DOT-TSC-838)
(PB-269402/4; DOT-TSC-UMTA-77-6-3;
UMTA-MA-06-0025-77-4) Avail: NTIS HC A05/MF A01 CSCL 13F

The test program comprised four phases of tests on two New York City Transit Authority R-32 cars where propulsion system had been replaced by an energy storage system. The four test phases were: verification of safe arrival, debugging procedures, performance verification tests, and expanded test program. GRA

N78-10486# AiResearch Mfg. Co., Torrance, Calif.
ENGINEERING TESTS FOR ENERGY STORAGE CARS AT THE TRANSPORTATION TESTS CENTER. VOLUME 4: RIDE ROUGHNESS TESTS Final Report, May 1974 - Jan. 1975
William T. Curran May 1977 168 p refs
(Contract DOT-TSC-838)
(PB-269403/2; DOT-TSC-UMTA-77-6-4;
UMTA-MA-06-0025-77-5) Avail: NTIS HC A08/MF A01 CSCL 13F

Tests were conducted to demonstrate the principles and feasibility of an energy storage type propulsion system, its adaptability to an energy storage type propulsion system, and

its adaptability to an existing car design. The program comprised four phases of tests on two New York City Transit Authority R-32 cars where the conventional propulsion system was replaced by an energy storage system. The four test phases were: (1) verification of safe arrival; (2) debugging procedures; (3) performance verification tests; and (4) expanded test program.
GRA

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N78-10487*# Aerospace Corp., El Segundo, Calif. Advanced Programs Div.
RELIABILITY MEASUREMENT DURING SOFTWARE DEVELOPMENT Final Report
H. Hecht, W. A. Sturm, and S. Trattner Sep. 1977 100 p refs
(Contract NAS1-14392)
(NASA-CR-145205; ATR-77(7590)-2) Avail: NTIS HC A05/MF A01 CSCL 14D

During the development of data base software for a multi-sensor tracking system, reliability was measured. The failure ratio and failure rate were found to be consistent measures. Trend lines were established from these measurements that provided good visualization of the progress on the job as a whole as well as on individual modules. Over one-half of the observed failures were due to factors associated with the individual run submission rather than with the code proper. Possible application of these findings for line management, project managers, functional management, and regulatory agencies is discussed. Steps for simplifying the measurement process and for use of these data in predicting operational software reliability are outlined. Author

N78-10488# Defense Systems Management School, Fort Belvoir, Va.
IMPROVEMENT OF WEAPON SYSTEMS RELIABILITY THROUGH RELIABILITY IMPROVEMENT WARRANTIES
John Dusan Shmoldas May 1977 53 p refs
(AD-A042932) Avail: NTIS HC A04/MF A01 CSCL 14/4

This report outlines the basic causes of poor weapon systems reliability. These include: (1) Military requirements that demand greater improvements in capability over improvements in reliability; (2) Inadequate development testing; and (3) The lack of incentive for producers of military hardware to increase reliability. The author explores the use of warranties by commercial airlines and its introduction into the Department of Defense. Next, he analyzes two USAF applications of Reliability Improvement Warranties (RIW)-- the F-111 displacement gyro and the ARN-118 TACAN--using data current through the end of CY 1976 in order to extract initial lessons learned. He recommends: Continued emphasis on testing improvements; Higher initial utilization of newly warranted equipments; Education and evaluation of maintenance and supply personnel in RIW procedures; Higher priorities for movement of failed units to contractor facilities; evaluation of a Swedish approach which utilizes military depots and existing logistics pipelines for servicing RIWs and continued allocation of resources to improve reliability state-of-the-art. GRA

N78-10489# California Univ., Berkeley. Operations Research Center.
MULTI-VALUED STATE COMPONENT RELIABILITY SYSTEMS
Sheldon M. Ross Jun. 1977 16 p refs
(Contract N00014-77-C-0299; Grant AF-AFOSR-3213-77; NR Proj. 042-379)
(AD-A042840; ORC-77-18) Avail: NTIS HC A02/MF A01 CSCL 14/4

Considered is a reliability system that is composed of n components each of which is operating at some performance level. It is supposed that there exists a nondecreasing function phi, called the structure function, such that phi(x sub 1, ..., x sub n) denotes the performance level of the system when the ith components performance level is x sub 1 . 1 = 1, ..., n. The binary variables are both arbitrary nonnegative numbers and some of the important results of the usual binary model are extended to this more general framework. In particular a fundamental inequality is obtained for E[phi(x sub 1, ..., x sub n)] when phi is binary which can, among other things, be used to generate a host of inequalities concerning IFRA distributions including, as a special case, the IFRA convolution theorem. The concept of the IFRA stochastic process is defined and the analog of the IFRA closure theorem is proven as well as NBU stochastic processes. GRA

N78-10490# National Bureau of Standards, Washington, D. C. Inst. for Basic Standards.
IMPROVED ULTRASONIC STANDARD REFERENCE BLOCKS Final Report, 1 Jan. 1974 - 31 Dec. 1975
G. F. Sushinsky, D. G. Eitzen, D. J. Chwirut, C. J. Bechtoldt, and A. W. Ruff Wright-Patterson AFB, Ohio AFML Apr. 1977 134 p refs
(Contract F33615-74-M-6752; AF Proj. 7381)
(AD-A042787; NBSIR-76-984; AFML-TR-77-40) Avail: NTIS HC A07/MF A01 CSCL 11/6

A program to improve the quality, reproducibility and reliability of nondestructive testing through the development of an improved ASTM-type ultrasonic reference standards system is described. Reference blocks of aluminum, steel, and titanium alloys are considered. Equipment representing the state-of-the-art in laboratory and field ultrasonic equipment was obtained and evaluated. RF and spectral data on twenty-two sets of ultrasonic reference blocks were taken as part of a task to quantify the variability in response from nominally identical blocks. Techniques for residual stress, preferred orientation, and microstructural measurements were refined and applied to reference blocks rejected by manufacturers during fabrication in order to evaluate the effect of metallurgical condition on block response. The effects of certain dimensional variables on block response were studied and new fabrication techniques considered. A study of the effects of measurement system variables on block response was carried out. A calibration service for ASTM E127-type reference blocks has been established and the development of a loaner service for calibration blocks is underway. Author (GRA)

N78-10491# California Univ., Berkeley. Operations Research Center.
ANALYSIS OF TIME BETWEEN FAILURES FOR REPAIRABLE COMPONENTS
Richard E. Barlow and Bernard Davis Jul. 1977 22 p refs
(Contract AF-AFOSR-3179; AF Proj. 2304)
(AD-A043573; ORC-77-20) Avail: NTIS HC A02/MF A01 CSCL 14/4

A method for analyzing time between failure data is developed. The method uses total time on test plots for a nonhomogeneous Poisson process failure model. Engine failure data is used to illustrate the method. A graphical method for determining optimum replacement intervals is presented. Author (GRA)

N78-10492# Purdue Univ., Lafayette, Ind. Lab. for Applied Industrial Control.
USER'S MANUAL FOR GRASP (GRAPHICAL RELIABILITY ANALYSIS PROGRAM)
Joseph Polito, Jr. and Clifford C. Peterson Apr. 1976 239 p refs
(Grant NSF ATA-73-07822-A01)
(PB-269639/1; NSF/RA-760597; Rept-75; Bull-143) Avail: NTIS HC A11/MF A01 CSCL 14D

The Grasp program is a computer simulation approach to solving problems in which the failure and end of repair events are modeled according to the probability laws of the individual components of the system. The modeling philosophy of Grasp (and Gerts) is that reliability configurations can be represented as network diagrams on which the parameters and logical relationships are specified. This network then is easily converted into a set of data cards. No programming is required. A notation that is an extension of block diagrams commonly used in reliability work, is presented. From these diagrams, the preparation of equivalent Grasp networks is a straightforward process. Grasp

is a collection of Ansi FORTRAN subprograms, and the user is required to have only a FORTRAN compiler, a line printer, and disk storage. GRA

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N78-10493* National Aeronautics and Space Administration. Pasadena Office, Calif.

MACHINE FOR USE IN MONITORING FATIGUE LIFE FOR A PLURALITY OF ELASTOMERIC SPECIMENS Patent

George E. Fitzer, inventor (to NASA) (JPL) Issued 21 Jun. 1977 8 p Filed 29 Jan. 1976 Supersedes N76-17427 (14 - 08, p 0985) Sponsored by NASA

(NASA-Case-NPO-13731-1; US-Patent-4,030,348; US-Patent-Appl-SN-653682; US-Patent-Class-73-91; US-Patent-Class-73-15.6) Avail: US Patent Office CSCL 20K

An improved machine is described for use in determining the fatigue life for elastomeric specimens. The machine is characterized by a plurality of juxtaposed test stations, specimen support means located at each of the test stations for supporting a plurality of specimens of elastomeric material, and means for subjecting the specimens at each of said stations to sinusoidal strain at a strain rate unique with respect to the strain rate at which the specimens at each of the other stations is subjected to sinusoidal strain. Official Gazette of the U.S. Patent Office

N78-10494 Shock and Vibration Information Center (Defense), Washington, D. C.

SHOCK AND VIBRATION DIGEST, VOLUME 9, NO. 10

Oct. 1977 88 p refs

Avail: SVIC, Code 8404, Naval Res. Lab., Washington, D. C. 20375; $15.00/Set

Vibration simulators, flow-induced vibrations, and dynamic response of structural members are reviewed. For individual titles, see N78-10495 through N78-10497.

N78-10495 Tustin Inst. of Tech., Santa Barbara, Calif.

A COMPARISON OF TECHNIQUES AND EQUIPMENT FOR GENERATING VIBRATION

W. Tustin *In* Shock and Vibration Inform. Center Shock and Vibration Digest, Vol. 9, No. 10 Oct. 1977 p 3-10 refs (For availability see N78-10494 01-39)

Avail: SVIC, Code 8404, Naval Res. Lab., Washington, D. C. 20375; $15.00/Set

The state-of-the-art of flow-induced vibration of circular cylindrical structures to indicate areas that need further work is reviewed. Both parallel and cross flow problems are considered. Part I of the review contains a general discussion of analytical methods, classification of structural responses, and characteristics of the vibration of cylinders in stationary fluid and parallel flow. Part II considers cross-flow-induced vibration, design, and research needs. Author

N78-10496 Ohio State Univ., Columbus.

RECENT RESEARCH IN PLATE VIBRATIONS: CLASSICAL THEORY

A. W. Leissa *In* Shock and Vibration Inform. Center Shock and Vibration Digest, Vol. 9, No. 10 Oct. 1977 p 13-24 refs (For availability see N78-10494 01-39)

Avail: SVIC, Code 8404, Naval Res. Lab., Washington, D. C. 20375, $15.00/Set

A two-part review of literature published over the period 1973-1976 that deals with free, undamped vibrations of plates is presented. Part I is limited to problems governed by the classical theory of plates. Complicating effects is the subject of Part II. Author

N78-10497 Argonne National Lab., Ill.

FLOW INDUCED VIBRATIONS OF CIRCULAR CYLINDRICAL STRUCTURES. PART I: STATIONARY FLUIDS AND PARALLEL FLOW

S.-S. Chen *In* Shock and Vibration Information Center Shock and Vibration Digest, Vol. 9, No. 10 Oct. 1977 p 25-38 refs (For availability see N78-10494 01-39)

Avail: SVIC, Code 8404, Naval Res. Lab., Washington, D. C. 20375; $15.00/Set

The mechanical, electrohydraulic, electromagnetic, and pneumatic shaker types are reviewed. Vibroacoustic facilities are also discussed. Author

N78-10498 Princeton Univ., N. J.

THE COUPLED RESPONSE OF A DYNAMIC ELEMENT RIDING ON A CONTINUOUSLY SUPPORTED BEAM Ph.D. Thesis

Alexander Apostolos Alexandridis 1977 170 p

Avail: Univ. Microfilms Order No. 77-14232

The dynamic interaction between a Linear Induction Motor primary, modelled as a spring-mass-damper dynamic element, and its secondary, modelled as a prestressed, continuously supported, infinitely long beam, was analyzed both theoretically and experimentally. The stability of the fully coupled dynamic system was determined analytically for all motor speeds by direct solution of the system characteristic equation. The existence of two transition speeds was established. At the lower transition speed, the frequency and damping ratio of the coupled system response attain their minimum and maximum values, respectively. Experimentally determined values of the frequency and damping ratio confirm the validity of the mathematical model. Dissert. Abstr.

N78-10499 Georgia Inst. of Tech., Atlanta.

OPTIMIZATION OF SHALLOW ARCHES AGAINST SNAP-THROUGH BUCKLING Ph.D. Thesis

Hartley McMullin Caldwell, III 1977 205 p

Avail: Univ. Microfilms Order No. 77-15045

The problem is formulated on the basis of displacement and discretized via the finite element method. Equilibrium equations are then obtained from the principle of the stationary value of total potential. The buckling criterion is obtained from Trefftz' interpretation of the energy criterion for stability. In the case of unstable bifurcation, critical conditions are found by requiring a nontrivial buckled mode. In the case of limit point (symmetric mode) instability critical conditions are those at which the second variation of the total potential becomes positive semi-definite. With the equations now obtained sufficient for the analysis of any given design, the construction of the optimality criterion necessary for the optimal design for each type of instability is made. By equating to zero the second variation of the total potential, the functional is obtained which defines the axial thrust within the arch at the critical point. Constraining this functional upon extremization one obtains the optimality criterion for each type of buckling failure. Dissert. Abstr.

N78-10500 Rensselaer Polytechnic Inst., Troy, N. Y.

AN IMPLICIT FUNCTIONAL THEORY OF VISCOPLASTICITY Ph.D. Thesis

Kenneth Paton Walker 1976 421 p

Avail: Univ. Microfilms Order No. 77-13708

A constitutive theory suitable for the description of metallic material behavior was developed within the framework of a thermodynamical continuum theory. A functional theory was proposed in which the stress depends on the strain history through a multiple integral expansion. The theory was developed to handle rate-dependence, finite deformation and temperature variations. Dissert. Abstr.

N78-10501 Illinois Inst. of Tech., Chicago.

BUCKLING OF CORRUGATED OPEN CYLINDRICAL SHELLS Ph.D. Thesis

Bhagwat Prasad Jain 1976 83 p

Avail: Univ. Microfilms Order No. 77-13746

The critical buckling stess of a corrugated open cylindrical shell with free longitudinal edges subjected to uniform axial compression in the direction parallel to the corrugations is determined. Only sinusoidal type of corrugation is examined. The analysis is based on the assumption of small deflection theory and that a corrugated shell can be analyzed as a thin, orthotropic shell of uniform thickness with material constants equal to the

gross material constants of one repeating cross-section of the corrugated panel in the shell. The equations of compatibility and equilibrium have been solved by assuming a general type of deflection function which is applicable to any type of boundary conditions along the longitudinal edges. The buckling stress is obtained numerically by iterative procedure. Dissert. Abstr.

N78-10502 Brown Univ., Providence, R. I.
DYNAMIC BEHAVIOR OF SOME SOLIDS AND LIQUIDS Ph.D. Thesis
Byung Kon Min 1976 162 p
Avail: Univ. Microfilms Order No. 77-14168

The dynamic response of some liquids under large amplitude, transient, tensile stress wave loading was studied. Theoretical predictions of the conditions for cavitation under such loading were reviewed and experimental methods of studying cavitation are described. The results from the methods are then compared with theoretical predictions. The cavitation threshold or the tensile strength of the liquids determined by the methods was shown to be in the range predicted by the theory of dynamic bubble growth and of nucleation from imperfectly wetted solid surfaces. Dissert. Abstr.

N78-10503 Michigan Technological Univ., Houghton.
LARGE DEFLECTION CREEP BUCKLING OF SHELLS WITH NONSYMMETRICAL IMPERFECTIONS: FINITE DIFFERENCE NUMERICAL APPROACH COUPLED WITH A REFERENCE STRESS CONCEPT Ph.D. Thesis
Vijay Kumar Sazawal 1975 198 p
Avail: Univ. Microfilms Order No. 77-15303

An approximate method of determining the critical time for shells under creep conditions was developed. The method is based on defining a time dependent reference stress, which is related to the actual elastic buckling stress of the shell by a creep reduction factor. Numerical analysis was carried out by using quasi-linearization to reduce the nonlinear problem to an iterative set of linear problems which are solved by finite differences. The success of the method was demonstrated by a few examples. It was shown that the results from the theory compare favorably with the experimental data. The results indicate that the secant modulus reference stress concept proposed estimates critical time for a shell more closely than another approximate method based on secant and tangent moduli. This is especially true for long time creep analyses where the proposed theory leads to more realistic predictions. Dissert. Abstr.

N78-10504 Polish Academy of Sciences, Warsaw.
USE OF STEREOPHOTOGRAMETRIC METHODS FOR ANALYZING THE KINEMATICS AND DYNAMICS OF SHELLS [ZASTOSWANIE STEREOFOTOGRAMETRYCZNYCH METOD DO ANALIZY KINEMATYKI I DYNAMIKI POWLOK]
Tadeusz Bednarski 30 Mar. 1977 165 p refs In POLISH
Avail: Issuing Activity

A theory was developed, and used to demonstrate practical application of stereophotogrammetric methods of spatial measurement to analyze the kinematics, statics, and dynamics of problems of plane stress, taking into account heterogeneous plastic characteristics of a medium in conditions of finite deformations. The methods were verified using analysis of processes of statically and dynamically protruding plastic heterogeneous shells of circular membranes, hardened on the periphery and loaded with pressure. Mathematical processing of the photogrammetric method of analyzing stereoscopic photographs to determine the motion function was carried out. A method of stereoscopic photograph analysis based on projective transformations was developed. Author

N78-10505 Polish Academy of Sciences, Warsaw.
LIMITED LOAD CAPACITY OF A CERTAIN TYPE OF STEEL CONSTRUCTION JOINT [NOSNOSC GRANICZNA PEWNEGO TYPU WEZLOW KONSTRUKCJI STALOWYCH]
Krzysztof Poltorak and J. Szlagowski 14 Jan. 1977 244 p refs In POLISH
Avail: Issuing Activity

Stress analysis of welded steel joints of structural members was performed to determine the limiting load capacity of joints. Special cases of two converging bars were analyzed and the load capacity defined. I.M.

N78-10506*# Martin Marietta Corp., Denver, Colo.
DESIGN, FABRICATION AND TEST OF A LIGHTWEIGHT SHELL STRUCTURE, PHASE 3 Quarterly Progress Report, 27 Jun. - 25 Sep. 1977
25 Sep. 1977 50 p
(Contract NAS8-31854)
(NASA-CR-150436; MCR-77-256-Issue-2; QPR-2) Avail: NTIS HC A03/MF A01 CSCL 20K

Progress is reported in the construction of lightweight orthogrid shells. Graphite/epoxy panels are being used in the fabrication. The shell structure is diagramed in detail. Panel laminates, and panel stiffener flanges are described while illustrations delineate panel assembly procedures. B.L.P.

N78-10507*# Lehigh Univ., Bethlehem, Pa.
STRESS-INTENSITY FACTORS FOR A WEDGE-LOADED EDGE CRACK IN A SEMI-INFINITE STRIP
F. Erodogan and H. Terada (Natl. Aerospace Lab., Tokyo) Jul. 1977 32 p refs
(Grants NGR-39-007-011; NSF ENG-77-19127)
(NASA-CR-145264) Avail: NTIS HC A03/MF A01 CSCL 20K

The problem of a semi infinite strip containing an edge crack is considered. It is assumed that the strip is loaded by a frictionless rigid wedge pressed into the crack. The resulting crack contact problem is formulated in terms of a system of singular integral equations. The behavior of the solution near the singular points is studied in detail. A series of numerical examples are given and the results are compared with those obtained by the method of boundary collocation and by the simple beam theory. Author

N78-10508*# Lehigh Univ., Bethlehem, Pa.
TRANSVERSE SHEAR EFFECTS ON THE STRESS-INTENSITY FACTOR FOR A CIRCUMFERENTIALLY CRACKED, SPECIALLY ORTHOTROPIC CYLINDRICAL SHELL
F. Delale and F. Erdogan Jul. 1977 44 p refs
(Grants NGR-39-007-011; NSF ENG-77-19127)
(NASA-CR-145265) Avail: NTIS HC A03/MF A01 CSCL 20K

The problem of a cylindrical shell containing a circumferential through crack is considered by taking into account the effect of transverse shear deformations. The formulation is given for a specially orthotropic material within the confines of a linearized shallow shell theory. The particular theory used permits the consideration of all five boundary conditions regarding moment and stress resultants on the crack surface. Consequently, aside from multiplicative constants representing the stress intensity factors, the membrane and bending components of the asymptotic stress fields near the crack tip are found to be identical. The stress intensity factors are calculated separately for a cylinder under a uniform membrane load, and that under a uniform bending moment. Sample results showing the nature of the out-of-plane crack surface displacement and the effect of the Poisson's ratio are presented. Author

N78-10509*# Lehigh Univ., Bethlehem, Pa.
STRESS-INTENSITY FACTORS FOR A THICK-WALLED CYLINDER CONTAINING AN ANNULAR IMBEDDED OR EXTERNAL OR INTERNAL SURFACE CRACK
Ragip Erdol (Black Sea Technical Univ.) and F. Erdogan Aug. 1976 25 p refs
(Grants NGR-39-007-011; NSF ENG-73-045053-A01)
(NASA-CR-145266) Avail: NTIS HC A02/MF A01 CSCL 20K

The elastostatic axisymmetric problem for a long thick-walled cylinder containing a ring-shaped internal or edge crack is considered. Using the standard transform technique the problem is formulated in terms of an integral equation which has a simple Cauchy kernel for the internal crack and a generalized Cauchy kernel for the edge crack as the dominant part. As examples the uniform axial load and the steady-state thermal stress problems have been solved and the related stress intensity factors have been calculated. Among other findings the results show that in the cylinder under uniform axial stress containing

an internal crack the stress intensity factor at the inner tip is always greater than that at the outer tip for equal net ligament thicknesses and in the cylinder with an edge crack which is under a state of thermal stress the stress intensity factor is a decreasing function of the crack depth, tending to zero as the crack depth approaches the wall thickness. Author

N78-10510*# Maryland Univ., College Park. Dept. of Aerospace Engineering.
ALTERNATIVES FOR NASTRAN MAINTENANCE, MODIFICATION AND DISSEMINATION Final Report
Harry G. Schaeffer [1977] 29 p
(Grant NsG-1193)
(NASA-CR-155220; AE-77-1) Avail: NTIS HC A03/MF A01 CSCL 20K

Various alternatives to direct NASA support of the program are considered ranging from no support at one end of the spectrum to subsidizing a non profit user's group at the other. Of all the alternatives that are developed, the user group appears to be most viable. NASA's past and future roles in the development of computerized technology are also considered. The need for an institute for computational analysis is identified and NASA's possible involvement is described. The goals of the proposed institute and research funds to support an activity that has the potential of a much larger impact on the technical community are identified. Author

N78-10511*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN OPTIMALITY CRITERION FOR SIZING MEMBERS OF HEATED STRUCTURES WITH TEMPERATURE CONSTRAINTS
G. Venkateswara Rao, Charles P. Shore, and R. Narayanaswami (Old Dominion Univ., Norfolk, Va.) Washington Oct. 1977 44 p refs
(NASA-TN-D-8525; L-11601) Avail: NTIS HC A03/MF A01 CSCL 20K

A thermal optimality criterion is presented for sizing members of heated structures with multiple temperature constraints. The optimality criterion is similar to an existing optimality criterion for design of mechanically loaded structures with displacement constraints. Effectiveness of the thermal optimality criterion is assessed by applying it to one- and two-dimensional thermal problems where temperatures can be controlled by varying the material distribution in the structure. Results obtained from the optimality criterion agree within 2 percent with results from a closed-form solution and with results from a mathematical programming technique. The thermal optimality criterion augments existing optimality criteria for strength and stiffness related constraints and offers the possibility of extension of optimality techniques to sizing structures with combined thermal and mechanical loading. Author

N78-10512# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
ON THE FAILURE OF ELLIPTICITY AND THE EMERGENCE OF DISCONTINUOUS DEFORMATION GRADIENTS IN PLANE FINITE ELASTOSTATICS
James K. Knowles and Eli Sternberg Jun. 1977 91 p refs
(Contract N00014-75-C-0196)
(AD-A042513; TR-37) Avail: NTIS HC A05/MF A01 CSCL 20/11

This investigation concerns equilibrium fields with discontinuous displacements gradients, but continuous displacements, in the theory of finite plane deformations of possibly anisotropic, compressible elastic solids. Elastostatic shocks of this kind, which resemble in many respects gas-dynamical shocks associated with steady flows, are shown to exist only if and when the governing field equations of equilibrium suffer a loss of ellipticity. The local structure of such shocks, near a point on the shock-line, is studied with particular attention to weak shocks, and an example pertaining to a shock of finite strength is explored in detail. Also, necessary and sufficient conditions for the dissipativity of time-dependent equilibrium shocks are established. Finally, the relevance of the analysis carried out here to localized shear failures - such as those involved in the formation of Lueders bands - is discussed. Author (GRA)

N78-10513# Army Materials and Mechanics Research Center, Watertown, Mass. Engineering Mechanics Div.
COMPUTER PROGRAM FOR ANALYSIS OF STRESS-STRAIN DATA Final Report
R. Papirno Apr. 1977 27 p Revision of AMMRC-TR-77-11
(DA Proj. 1T1-62105-AH-84)
(AD-A042322; AMMRC-TR-77-11) Avail: NTIS MF A01 CSCL 09/2

A computer program, previously developed for fitting analytic curves to experimental stress-strain data and described in AMMRC TR 76-12 and its Supplement, has been revised. The program determines the three parameters required for the Ramberg-Osgood equation and two additional constants for a power law approximation for data beyond the Ramberg-Osgood secant yield stress. The revisions include a routine to arrange the input data in increasing order of stress-strain magnitude; a new method for tangent modulus calculation; a data extrapolation routine for the case where the last input data point is a small increment below the secant yield stress; additional statistical calculations to indicate goodness-of-fit of the data; and output values expressed in S-I metric units as well as customary English units. A number of nonessential analyses and their associated outputs have been eliminated. User instructions, samples of the output, and a program listing are included. Author (GRA)

N78-10514# Army Electronics Command, Fort Monmouth, N.J.
NASTRAN DATA GENERATING PROGRAMS AND ANALYTICAL MODELS FOR ANALYSIS OF ANTENNA MAST AND TOWER STRUCTURES Final Report
James W. Jeter, Jr. Jul. 1977 30 p
(AD-A042594; ECOM-4508) Avail: NTIS HC A03/MF A01 CSCL 09/5

This report is concerned with the development of data generating programs and analytical models to facilitate the structural analysis of antenna mast and tower structures subjected to static and dynamic loadings. The programs generate the data cards necessary to define the structure geometry and material properties of typical masts and towers for the NASA Structural Analysis Program (NASTRAN). The automatic data generating program for masts can be used to model any mast of constant cross section and can handle any number of cable tie points and anchor points; deform cards to duplicate cable pretension are also generated as well as the force cards needed for representing a uniform wind type pressure. The automatic data generator for towers generates a series of tower stages and considers four (4) variations of tower geometry, three (3) possible base conditions and any number of sides greater than two (2). This program was designed for towers with regular generation properties and equal side lengths, but a separate program enables some variations in side length to be considered. In order to provide an economical but efficient NASTRAN model for analyzing antenna towers, three models, with varying degrees of exactness were investigated using several NASTRAN rigid formats for analysis. The capabilities and limitations of these models, with respect to the rigid formats considered, were studied.
Author (GRA)

N78-10515# Naval Research Lab., Washington, D. C.
STRUCTURAL INTEGRITY OF WATER REACTOR PRESSURE BOUNDARY COMPONENTS Progress Report, period ending 28 Feb. 1977
F. J. Loss May 1977 58 p refs
(Contract AT(49-24)-0207)
(AD-A042219; NRL/NUREG-MR-3512) Avail: NTIS HC A04/MF A01 CSCL 11/6

This report describes research progress in a continuing program to characterize materials properties performance with respect to structural integrity of light water reactor pressure boundary components. Progress for this reporting period is summarized in the following areas: (a) Radiation embrittlement resistance of A533-B Class 1 steel plate as a function of extra low copper impurity content (b) Influence of phosphorus and copper content on post-irradiation upper shelf toughness and postirradiation toughness recovery for A533-B steel plate and weld metal (c) Investigations of warm prestress and plastic net ligament phenomena as a means to mitigate crack extension in a vessel during a loss of coolant accident (d) Evaluation of

critical factors in crack growth rate studies in a pressurized water reactor environment. Author (GRA)

N78-10516# Naval Research Lab., Washington, D. C. Shock and Vibration Information Center.

THE SHOCK AND VIBRATION DIGEST, VOLUME 9, NUMBER 7

Ronald L. Eshleman, Judith Nagle-Eshleman, Milda Tamulionis, R. Belsheim, and R. L. Bort Jul. 1977 90 p

(AD-A042522) Avail: NTIS HC A05/MF A01 CSCL 05/2

Various articles, book reviews, short courses, news briefs, and current abstracts dealing with sound, shock, and vibration technology are presented. Articles included are: (1) Techniques for the Design of Highly Damped Structures; (2) A Review of Ship Hull Vibration, Part Four: Comparison of Beam Models; and (3) Underwater Fluid Structure Interaction, Part Four: Hydrodynamically Applied Forces (Moving Medium). G.D.H.

N78-10517# Naval Research Lab., Washington, D. C. Shock and Vibration Information Center.

THE SHOCK AND VIBRATION DIGEST, VOLUME 9, NUMBER 8

Aug. 1977 73 p refs

(AD-A043655) Avail: Naval Research Lab. code 8404, Shock and Vibration Information, Washington, D. C. 20375; HC $40.00 center CSCL 20/11

Partial contents: Turbomachinery Vibration; The Characteristics of Dynamic Loads and Response of Buildings; Exhaust Noise/and Its Control -- A review; and Abstracts from the Current Literature. GRA

N78-10518# New Mexico Univ., Albuquerque. Eric H. Wang Civil Engineering Research Facility.

BEHAVIOR OF REINFORCED CONCRETE BEAMS UNDER COMBINED AXIAL AND LATERAL LOADING Final Report

Golden E. Lane, Jr. Kirtland AFB, N. Mex. AFWL May 1977 146 p refs

(Contract F29601-76-C-0015)

(AD-A043357; AFWL-TR-76-130; CERL-SSR-8) Avail: NTIS MF A01 CSCL 11/2

Seventeen simply supported reinforced concrete beams were tested to collapse under combined flexural, axial, and shear forces. Each beam had a 12.5-foot span, a 9-by-15-inch cross section, and an effective depth of 12.5 inches. Reinforcement consisted of No. 2 stirrups, 6 inches on center. The beams were loaded laterally through a symmetrical two-point loading system and axially through the plastic centroid. Load was applied by a single hydraulic system designed to provide a constant ratio between axial and lateral loads for the duration of the tests. The two test parameters were axial-to-lateral-load ratio and shear-span-to-beam-depth ratio. Electrical measurements of beam behavior included steel strain on the longitudinal rebar, concrete strain, vertical deflections along the length of the beam, end rotations, and lateral and axial loads. In addition, a photoelastic coating sheet was bonded to one side of the beams and overlaid with a sheet of Polaroid film. The experimental results from the beam tests were compared with data calculated with an analytical behavioral model developed as part of this effort. The general beam behavior calculated from the analytical model agreed well with the measured results, especially in the region up to maximum load. Author (GRA)

N78-10519# California Univ., Los Angeles. School of Engineering and Applied Science.

INTERNAL STRESSES DUE TO AN OBLATE SPHEROIDAL INCLUSION: MISFIT, INHOMOGENEITY AND PLASTIC DEFORMATION EFFECTS

M. Shibata and Kanji Ono Aug. 1977 44 p refs

(Contract N00014-75-C-0889)

(AD-A044242; TR-4) Avail: NTIS HC A03/MF A01 CSCL 20/11

Internal stress in and around an oblate spheroidal inclusion is evaluated by using Eshelby theory. We consider three different sources of internal stress as a function of the aspect ratio and elastic moduli ratio; these are (1) misfit effect (2) inhomogeneity effect and (3) plastic deformation effect. The misfit effect arises from the difference of thermal expansion coefficients of the matrix and inclusion. Normal stresses within the inclusion (or the principal stresses), maximum shear stress inside the inclusion, total strain energy and the normal stress at the matrix-inclusion boundary are determined. The inhomogeneity effect arises from the difference of the elastic moduli of the matrix and inclusion, which perturbs otherwise uniform applied stress. The direction of applied stresses is parallel to the axis of revolution of the inclusion. Normal stresses within the inclusion and at the matrix-inclusion boundary are obtained. Plastic deformation of the matrix in the presence of a plastically non-deformable inclusion produces internal stresses, as shown by Ashby and by Tanaka and Mori. The approach developed by Tanaka and Mori is extended here to evaluate the internal stresses for the inclusion geometries appropriate to the analysis of technically important cases. The results of the present calculations in limiting cases agree with previously published calculations. Implications of the results are dicussed in connection with several experimental studies. Author (GRA)

N78-10520# California Univ., Livermore. Lawrence Livermore Lab.

NUMERICAL SIMULATION OF TORNADO-BORNE MISSILE IMPACT

David K. Tu and R. C. Murray 8 Feb. 1977 44 p refs

(Contract W-7405-eng-48)

(UCRL-52223) Avail: NTIS HC A03/MF A01

The feasibility of using a finite element procedure to examine the impact phenomenon of a tornado-borne missile impinging on a reinforced concrete barrier was assessed. The major emphasis of this study was to simulate the impact of a nondeformable missile. Several series of simulations were run, using an 8-in.-dia steel slug as the impacting missile. The numerical results were then compared with experimental field tests and empirical formulas. The work is in support of tornado design practices for fuel reprocessing and fuel fabrication plants. ERA

N78-10521# Brookhaven National Lab., Upton, N. Y.

ASSESSMENT OF NON-LINEAR ANALYSIS FINITE ELEMENT PROGRAM (NONSAP) FOR INELASTIC ANALYSIS

T. Y. Chang, S. Prachuktam, and M. Reich Nov. 1976 37 p refs

(Contract EY-76-C-02-0016)

(BNL-NUREG-50615) Avail: NTIS HC A03/MF A01

An assessment of a nonlinear structural analysis finite element program called NONSAP is given with respect to its inelastic analysis capability for pressure vessels and components. The assessment was made from the review of its theoretical basis and bench mark problem runs. It was found that NONSAP has only limited capability for inelastic analysis. However, the program is flexible enough for extension or modification to suit the user's need. Some of the numerical difficulties in using NONSAP are discussed. ERA

N78-10522# Texas Univ., Austin. Center for Highway Research.

PERMANENT DEFORMATION CHARACTERISTICS OF ASPHALT MIXTURES BY REPEATED-LOAD INDIRECT TENSILE TEST

Joaquin Vallejo, Thomas W. Kennedy, and Ralph Haas Jun. 1976 89 p refs Sponsored by Texas State Dept. of Highways and Public Transportation and DOT

(PB-269356/2; CFHR-3-9-72-183-7; FHWA/TX/RR-183-7) Avail: NTIS HC A05/MF A01 CSCL 13C

The basic concepts of the permanent deformation structural subsystem, the properties required, and the possible methods required to obtain these properties are reviewed. Special consideration is given to the permanent deformation parameters given by VESYS IIM. Results suggest that the repeated-load indirect tensile test can be used to obtain the permanent deformation characteristics or properties required for the structural design and analysis of pavements. It was also found that the permanent deformation behavior obtained using this test is similar to that obtained using a triaxial test with an axial tensile stress. GRA

N78-10523# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.

INVESTIGATION OF POLYMER IMPREGNATED CONCRETE PIPE

W. C. Cowan and H. C. Riffle Sep. 1977 54 p Revised
(PB-269414/9; REC-ERC-74-14-Rev) Avail: NTIS HC A04/MF A01 CSCL 13K

The evaluation of structural and durability properties of polymer-impregnated concrete (PIC) pipe as compared with those of commercially manufactured concrete pipe is presented in three separate studies: (1) 4-inch-diameter concrete draintile, (2) 12- and 24-inch-diameter concrete sewer and culvert pipe; and (3) 36-inch-diameter concrete culvert pipe. Impregnation and polymerization of concrete pipe result in significant improvement in strength and durability. Polymer impregnation of concrete draintile increases the three-edge bearing strength from about 70 to 280 percent above that of the untreated pipe. The three-edge bearing strength of 12- and 24-inch unreinforced concrete sewer and culvert pipe was increased from about 110 to 150 percent by polymer impregnation. GRA

N78-10524# Sydney Univ. (Australia). Civil Engineering Labs.
THE EXPANSION OF A CYLINDER UNDER CONDITIONS OF FINITE PLANE STRAIN
J. P. Carter Nov. 1976 22 p refs
(PB-269757/1; R-297) Avail: NTIS HC A02/MF A01 CSCL 20K

The expansion of an initially thick-walled cylinder due to an internal pressure under conditions of plane strain is considered. The cylinder is composed of an elastoplastic, Tresca material with an associated flow rule. No restriction is placed on the magnitude of the deformation or on the magnitude of material parameters. Solutions are presented for a particular initial (stress free) geometry, and it is shown that the maximum value of the internal pressure is a function of the deformation to strength parameter ratio. GRA

N78-10525# Maryland Univ., College Park. Dept. of Civil Engineering.
LOAD FACTOR DESIGN RECOMMENDATIONS FOR STEEL I BEAM COMPOSITE HIGHWAY BRIDGES Final Report
C. P. Heins and J. Colville Sep. 1976 63 p refs Sponsored by Federal Highway Administration
(PB-269595/5; CE-63; AW-120-6; FHWA-MD-R-76-16) Avail: NTIS HC A04/MF A01 CSCL 13B

A comprehensive research program, designed to evaluate the load distribution and effective width of steel composite highway bridges, under factored loading is summarized. Results are given in the form of several empirical equations, for use in determining the load distribution and effective slab widths. Applications of these equations, relative to the design of several bridges, are given in detail. A commentary of the theory, model experiments, and correlation between theory and tests is also given. GRA

N78-10313# Indian Inst. of Tech., Bombay. Dept. of Mathematics.
BASIC ELECTRICITY
B. S. Ramachandra Rao *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 15 p (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10314# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
THIN PLATE THEORY
V. D. Dixit *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 7 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10315# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
THIN SHELL THEORY
R. S. Ayyar *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 22 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10316# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
HIGHER ORDER PLATE AND SHELL THEORIES
Tarun Kant *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 33 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10317# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
STABILITY OF PLATES AND SHELLS
S. Chatterjee *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 54 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10318# Indian Inst. of Tech., Bombay. Dept. of Mathematics.
DYNAMICS OF PLATES AND SHELLS
C. K. Ramesh *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 15 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10324# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
AN APPROXIMATE SOLUTION FOR CONTINUOUS PLATES
K. Rataiah *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 13 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10325# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
AN APPROXIMATE SOLUTION FOR POINT-SUPPORTED PLATES
K. Rajaiah *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 5 p (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

42 GEOSCIENCES (GENERAL)

N78-10526*# Old Dominion Univ. Research Foundation, Norfolk, Va.
A MODULAR RADIATIVE TRANSFER PROGRAM FOR GAS FILTER CORRELATION RADIOMETRY
Joseph C. Casas and Shirley A. Campbell Washington NASA Oct. 1977 71 p refs
(Grant NsG-1127)
(NASA-CR-2895; PGSTR-AP77-49) Avail: NTIS HC A04/MF A01 CSCL 04A

The fundamentals of a computer program, simulated monochromatic atmospheric radiative transfer (SMART), which calculates atmospheric path transmission, solar radiation, and thermal radiation in the 4.6 micrometer spectral region, are described. A brief outline of atmospheric absorption properties and line by line transmission calculations is explained in conjunction with an outline of the SMART computational procedures. Program flexibility is demonstrated by simulating the response of a gas filter correlation radiometer as one example of an atmospheric infrared sensor. Program limitations, input data requirements, program listing, and comparison of SMART transmission calculations are presented. Author

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N78-10527 Texas A&M Univ., College Station.
MONITORING AQUATIC PLANTS IN TEXAS Ph.D. Thesis
Arthur Robert Benton, Jr. 1976 331 p
Avail: Univ. Microfilms Order No. 77-12526

Tandem 70mm aerial photography, using color and color infrared film, was tested extensively. Emersed aquatic plant species were found to be readily differentiable on color infrared film; the submersed species somewhat less so. Areal spread of emersed species was easily delineated on color infrared imagery. Equivalent results were obtained with submersed species delineation by using high-speed color film coupled with a 500mm filter for improved water penetration. Color infrared photography was found to be particularly useful for recording sequential herbicide effects such as change in size of the stressed area, rate of stunting or killing off of the plant mat, period before regrowth and rate of regrowth into the cleared area. The cost of a monitoring system for the state of Texas is shown to be quite low. Dissert. Abstr.

N78-10528 Pennsylvania State Univ., University Park.
FLOODPLAIN DELINEATION USING MULTISPECTRAL SCANNER DATA Ph.D. Thesis
Donald Lee Henninger 1976 110 p
Avail: Univ. Microfilms Order No. 77-9769

Computer analysis techniques were applied to aircraft- and satellite-collected digital multispectral scanner (MSS) data to determine if floodplain boundaries could be accurately and quickly delineated in Pennsylvania. The criteria used to distinguish floodplain areas were natural indicators such as differences in vegetation and soils. Aircraft MSS data in the visible, the near infrared, and the intermediate infrared regions of the electromagnetic spectrum were analyzed for detection of natural features which could be associated with a floodplain boundary. Satellite (LANDSAT 1) MSS data in four spectral regions of the electromagnetic spectrum were also analyzed. Results indicate that computer analysis of remotely sensed digital MSS data has the potential of playing a prominent role in the identification and mapping of floodplain boundaries. Dissert. Abstr.

N78-10529* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
REMOTE SENSING OF VEGETATION AND SOIL USING MICROWAVE ELLIPSOMETRY Patent
Siegfried O. Auer (NAS-NRC) and John B. Schutt, inventors (to NASA) Issued 4 Oct. 1977 7 p Filed 15 Apr. 1976 Supersedes N76-23671 (14 - 14, p 1814)
(NASA-Case-GSC-11976-1; US-Patent-4,052,666; US-Patent-Appl-SN-677352; US-Patent-Class-324-58.5B) Avail: US Patent Office CSCL 08F

A method is described of determining vegetation height and water content of vegetation from the intensity and state of elliptical polarization of a reflected train of microwaves. The method comprises the steps of reflecting a circularly polarized train of microwaves from vegetation at a predetermined angle of incidence and detecting the reflected train of microwaves. The ratio of the intensities of the electric field vector components is determined, the phase difference of the components is measured, and the refractive index and thickness of the layer of vegetation are computed from a formula. The refractive index is given essentially by the water content of the vegetation.

Official Gazette of the U.S. Patent Office

N78-10530*# Department of the Northern Territory, Darwin (Australia).
ERTS B IMAGERY TO MONITOR LARGE SCALE CLEARING AND DEVELOPMENT PROGRAMMES IN THE DALY BASIN, NORTHERN TERRITORY
Blair G. Wood, Principal Investigator 26 Oct. 1977 2 p
Sponsored by NASA ERTS
(E78-10002; NASA-CR-155206) Avail: NTIS HC A02/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N78-10531*# Science Applications, Inc., La Jolla, Calif.
DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE FROM LANDSAT DATA Progress Report, 25 Jul. - 28 Oct. 1977
M. Griggs, Principal Investigator 28 Oct. 1977 8 p ERTS
(Contract NAS5-20899)
(E78-10004; NASA-CR-155208; SAI-77-911-lj; PR-11) Avail: NTIS HC A02/MF A01 CSCL 04A

There are no author-identified significant results in this report.

N78-10532*# Norsk Polarinstitutt, Oslo.
GLACIOLOGICAL AND MARINE BIOLOGICAL STUDIES AT PERIMETER OF DRONNING MAUD LAND, ANTARCTICA Final Report
Olav Orheim, Principal Investigator Jun. 1977 20 p refs
Sponsored by NASA Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E78-10006; NASA-CR-155210) Avail: NTIS HC A02/MF A01 CSCL 08L

The author has identified the following significant results. A nearly complete map of the Dronning Land coastline from 10 deg W to 29 deg E was produced. Based on this, it was determined that for the past 20 years, the minimum calving rate from this part of the coastline was 60 cu km/year. The drift speeds were measured for ice floes and bergs between 9 and 20 km/day, and it was found that the number of ice floes of a given size decrease exponentially with size, so that each size class covers approximately the same area. A large melt phenomena at blue ice fields around 70 deg 45' S and 26-29 deg E was discovered.

N78-10533*# Ohio Dept. of Economic and Community Development, Columbus.
DEVELOPMENT OF A MULTI-DISCIPLINARY ERTS USER PROGRAM IN THE STATE OF OHIO Quarterly Progress Report
Paul E. Baldridge, Principal Investigator 10 Sep. 1977 2 p ERTS
(Contract NAS5-22399)
(E78-10007; NASA-CR-155211; QPR-9) Avail: NTIS HC A02/MF A01 CSCL 05B

The author has identified the following significant results. The State of Ohio has an inventory in machine compatible form, such that, information about the land use in Ohio may be tailored to the requirements of the user and may be easily modified and updated as future needs arise.

N78-10534*# Environmental Research Inst. of Michigan, Ann Arbor.
WHEAT PRODUCTIVITY ESTIMATES USING LANDSAT DATA Progress Report, 16 May - 15 Oct. 1977
Richard F. Nalepka, John Colwell, Principal Investigators, Daniel P. Rice, and Patricia A. Bresnahan 15 Oct. 1977 13 p refs ERTS
(Contract NAS5-22389)
(E78-10009; NASA-CR-155213; ERIM-114800-37-L) Avail: NTIS HC A02/MF A01 CSCL 02C

The author has identified the following significant results. Large area LANDSAT yield estimates were generated. These results were compared with estimates computed using a meteorological yield model (CCEA). Both of these estimates were compared with Kansas Crop and Livestock Reporting Service (KCLRS) estimates of yield, in an attempt to assess the relative and absolute accuracy of the LANDSAT and CCEA estimates. Results were inconclusive. A large area direct wheat prediction procedure was implemented. Initial results have produced a wheat production estimate comparable with the KCLRS estimate.

N78-10535*# South Dakota State Univ., Brookings. Remote Sensing Inst.
HCMM ENERGY BUDGET DATA AS A MODEL INPUT FOR ASSESSING REGIONS OF HIGH POTENTIAL GROUNDWATER POLLUTION Interim Report, Jul. - Sep. 1977

Donald G. Moore, Principal Investigator, J. Tunheim, and J. Heilman Sep. 1977 14 p ref ERTS
(Contract NAS5-24206)
(E78-10010; NASA-CR-155214; QR-1) Avail: NTIS HC A02/MF A01 CSCL 08H

The author has identified the following significant results. The finite difference model was used to calculate the differences in surface temperature between two hypothetical sites which result from a temperature difference at 50 cm due to the presence of shallow ground water at one of the sites. Although qualitative results of the model seemed consistant with experimental results, further evaluation showed a need for taking account of differences in thermal conductivity due to different moisture profiles at the two sites considered.

N78-10536*# Texas A&M Univ., College Station. Remote Sensing Center.
LANDSAT/COASTAL PROCESSES Final Report, Jun. 1976 - Aug. 1977
Wesley P. James, Principal Investigator, John M. Hill, and Jon B. Bright Aug. 1977 105 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(NASA Order S-55812A)
(E78-10011; NASA-CR-155215; RSC-3380) Avail: NTIS HC A06/MF A01 CSCL 08C

The author has identified the following significant results. Correlations between the satellite radiance values water color, Secchi disk visibility, turbidity, and attenuation coefficients were generally good. The residual was due to several factors including systematic errors in the remotely sensed data, errors, small time and space variations in the water quality measurements, and errors caused by experimental design. Satellite radiance values were closely correlated with the optical properties of the water.

N78-10537*# Helsinki Univ. (Finland). Dept. of Geology.
INVESTIGATION OF LANDSAT IMAGERY ON CORRELATIONS BETWEEN ORE DEPOSITS AND MAJOR SHIELD STRUCTURES IN FINLAND Final Report, Jun. 1975 - Sep. 1977
Heikki V. Tuominen, Principal Investigator and Viljo Kuosmanen Sep. 1977 59 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. ERTS
(E78-10012; NASA-CR-155216) Avail: NTIS HC A04/MF A01 CSCL 08G

The author has identified the following significant results. Several regional lineaments appear to correlate with the distribution of ore deposits and showings. Combined study of LANDSAT summer and winter mosaics and color composites of geological, geomorphological, and geophysical maps makes the correlation more perceptible. The revealed pattern of significant lineaments in northern Finland is fairly regular. The most significant lineaments seen in LANDSAT mosaics are not detectable in single images.

N78-10538*# Kansas State Univ., Manhattan. Dept. of Statistics.
PLANTING DATA AND WHEAT YIELD MODELS Final Report, 15 Feb. 1975 - 31 Mar. 1977
Arlin M. Feyerherm, Principal Investigator Sep. 1977 89 p EREP
(Contract NAS9-14533)
(E78-10013; NASA-CR-151525) Avail: NTIS HC A05/MF A01 CSCL 02C

The author has identified the following significant results. A variable date starter model for spring wheat depending on temperature was more precise than a fixed date model. The same conclusions for fall-planted wheat were not reached. If the largest and smallest of eight temperatures were used to estimate daily maximum and minimum temperatures; respectively, a 1-4 F bias would be introduced into these extremes. For Kansas, a reduction of 0.5 bushels/acre in the root-mean-square-error between model and SRS yields was achieved by a six fold increase (7 to 42) in the density of weather stations. An additional reduction of 0.3 b/A was achieved by incorporating losses due to rusts in the model.

N78-10539*# Old Dominion Univ., Norfolk, Va. School of Engineering.
LABORATORY REQUIREMENTS FOR IN-SITU AND REMOTE SENSING OF SUSPENDED MATERIAL Final Report
Chin Y. Kuo and Robert Y. K. Cheng Mar. 1976 90 p refs
(Contract NAS1-11707)
(NASA-CR-145263; TR-76-C2) Avail: NTIS HC A05/MF A01 CSCL 08H

Recommendations for laboratory and in-situ measurements required for remote sensing of suspended material are presented. This study investigates the properties of the suspended materials, factors influencing the upwelling radiance, and the various types of remote sensing techniques. Calibration and correlation procedures are given to obtain the accuracy necessary to quantify the suspended materials by remote sensing. In addition, the report presents a survey of the national need for sediment data, the agencies that deal with and require the data of suspended sediment, and a summary of some recent findings of sediment measurements. Author

N78-10540*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
URBAN AREA DELINEATION AND DETECTION OF CHANGE ALONG THE URBAN-RURAL BOUNDARY AS DERIVED FROM LANDSAT DIGITAL DATA
Jerrold W. Christenson and Henry M. Lachowski (GE, Beltsville, Md.) Oct. 1977 10 p refs
(NASA-TM-X-71413; X-923-77-245) Avail: NTIS HC A02/MF A01 CSCL 08B

LANDSAT digital multispectral scanner data, in conjunction with supporting ground truth, were investigated to determine their utility in delineation of urban-rural boundaries. The digital data for the metropolitan areas of Washington, D. C.; Austin, Texas; and Seattle, Washington; were processed using an interactive image processing system. Processing focused on identification of major land cover types typical of the zone of transition from urban to rural landscape, and definition of their spectral signatures. Census tract boundaries were input into the interactive image processing system along with the LANDSAT single and overlayed multiple date MSS data. Results of this investigation indicate that satellite collected information has a practical application to the problem of urban area delineation and to change detection. Author

N78-10541*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A TECHNIQUE FOR THE DETERMINATION OF LOUISIANA MARSH SALINITY ZONE FROM VEGETATION MAPPED BY MULTISPECTRAL SCANNER DATA: A COMPARISON OF SATELLITE AND AIRCRAFT DATA
M. Kristine Butera Aug. 1977 57 p refs
(NASA-TM-58203; JSC-12529) Avail: NTIS HC A04/MF A01 CSCL 08H

Vegetation in selected study areas on the Louisiana coast was mapped using low altitude aircraft and satellite (LANDSAT) multispectral scanner data. Fresh, brackish, and saline marshes were then determined from the remotely sensed presence of dominant indicator plant associations. Such vegetational classifications were achieved from data processed through a standard pattern recognition computer program. The marsh salinity zone maps from the aircraft and satellite data compared favorably within the broad salinity regimes. The salinity zone boundaries determined by remote sensing compared favorably with those interpolated from line-transect field observations from an earlier year. Author

N78-10542*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM
Peter VanWie Feb. 1977 17 p Presented at Director's Sci. Seminar on Earth Resources Survey: Technol. Transfer and System Concept Develop., Greenbelt, Md., 2 Dec. 1976 Prepared in cooperation with Earth Satellite Corp., Washington, D. C. Original contains color illustrations
(Contract NAS5-22894)
(NASA-TM-X-71396; X-931-77-38) Avail: NTIS

HC A02/MF A01 CSCL 08H

The text and computer-generated displays used to demonstrate the AOIPS (Automatic and Oceanographic Information Processing System) water resources data management system are investigated. The system was developed to assist hydrologists in analyzing the physical processes occurring in watersheds. It was designed to alleviate some of the problems encountered while investigating the complex interrelationships of variables such as land-cover type, topography, precipitation, snow melt, surface runoff, evapotranspiration, and streamflow rates. The system has an interactive image processing capability and a color video display to display results as they are obtained. Author

N78-10543# Stanford Research Inst., Menlo Park, Calif.
INTERACTIVE AIDS FOR CARTOGRAPHY AND PHOTO INTERPRETATION Semiannual Technical Report, 12 Nov. 1976 - 12 May 1977
Harry G. Barrow May 1977 37 p refs
(Contract DAAG29-76-C-0057; ARPA Order 2894; SRI Proj. 5300)
(AD-A043418) Avail: NTIS HC A03/MF A01 CSCL 08/2

This report describes the status of the SRI Image Understanding project at the end of twelve months. The central scientific goal of the research program is to investigate and develop ways in which diverse sources of knowledge may be brought to bear on the problem of interpreting images. The research is focused on the specific problems entailed in interpreting aerial photographs for cartographic or intelligence purposes. A key concept is the use of a generalized digital map to guide the process of image interpretation. Author (GRA)

N78-10544# Army Engineer Topographic Labs., Fort Belvoir, Va.
AN ANALYSIS OF LANDSAT SYSTEMS FOR CARTOGRAPHIC AND TERRAIN INFORMATION Report No. 9 in ETL Series on Remote Sensing. Technical Report, Aug. - Dec. 1976
Theodore C. Vogel Jun. 1977 62 p
(DA Proj. 4A7-62707-A-855)
(AD-A044431; ETL-0103) Avail: NTIS HC A04/MF A01 CSCL 15/4

The scientific and technical literature is reviewed to analyze the capabilities of LANDSAT Systems 1, 2, 3, and 4 for hydrographic, topographic, planimetric, and thematic map compilation. The systems capabilities were analyzed according to the following qualitative code for a selected list of map and chart requirements: O Not detectable, the map element cannot be discerned or located from either type of LANDSAT data; 1 - Detectable, map element can be detected but not identified from the type of LANDSAT data indicated; 2 - Identifiable, map element can be detected and recognized as a particular type of feature from the LANDSAT data indicated, E.G. road, canal, etc., collateral information may be required to reach this analysis level; 3 - Classifiable LANDSAT data, with the use of all available collateral information, can provide the information required for the map element including all required measurements, e.g. width, length, and areas. It was concluded that LANDSAT 1, 2, 3 MSS data is compatible with National Map Accuracy Standards and can be used to update the map elements on map scales 1/ 1,000,000 through 1/ 250,000, although many of the cultural, hydrographic, and botanical elements may be unclassifiable. GRA

N78-10545# Netherland, Sewell and Associates, Inc., Dallas, Tex.
PRELIMINARY STUDY OF THE PRESENT AND POSSIBLE FUTURE OIL AND GAS DEVELOPMENT OF AREAS IMMEDIATELY SURROUNDING THE INTERIOR SALT DOMES UPPER GULF COAST SALT DOME BASINS OF EAST TEXAS, NORTH LOUISIANA, AND MISSISSIPPI
17 Dec. 1975 48 p refs
(Contract W-7405-eng-26)
(ORNL/Sub-75/87988) Avail: NTIS HC A03/MF A01

Present and possible future oil and gas development was investigated for the purpose of locating those salt domes where such oil and gas development would not interfere with the possible storage of radioactive waste material in the core of the salt dome. Preliminary findings indicate that several of the salt domes in each of the three basins under study are hydrocarbon barren and that the present and/or possible future oil and gas development on or in the areas immediately surrounding the salt domes should not interfere with the possible storage of radioactive waste material in the core of these salt domes. ERA

N78-10546# Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
COMPUTER TECHNIQUES TO AID IN THE INTERPRETATION OF SUBSURFACE FLUID-PRESSURE GRADIENTS
J. B. Wesselman and John Heath Jun. 1977 41 p refs
Sponsored by Dept. of Interior.
(PB-268603/8; USGS/WRD/WRI-77/035) Avail: NTIS HC A03/MF A01 CSCL 08I

Fluid-pressure gradients were investigated in two geopressured-geothermal areas in Texas and Louisiana. Data were obtained from drilling records, resistivity curves of geophysical logs, and pressure tests made in bore holes. These data were converted to gradients and graphed by computer techniques. Resistivity interpretation gave reasonable results at some point in about 70 percent of the wells. Evaluation of all available data shown in the individual and adjacent wells was found to be necessary for proper gradient interpretation. GRA

N78-10547# Minnesota Univ., Minneapolis. Resources Research Center.
A PRIMER ON LIMNOLOGY
John B. Lundquist Aug. 1975 36 p refs
(Contract DI-14-31-0001-5023; OWRT Proj. A-999-MINN(38))
(PB-268778/8; W77-08605; Public-Report-Ser-1; Contrib-142)
Avail: NTIS HC A03/MF A01 CSCL 08H

An introduction to limnology is provided. Some lake problems that are influenced by human activities are identified and some procedures for studying individual lakes are outlined. This introduction to limnology is comprehensible to readers with junior high and high school science backgrounds. Author

N78-10548# Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
QUANTITATIVE AND QUALITATIVE IMPLICATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES
Gert Aron, David A. Long, Arthur C. Miller, and Michael J. OBrien Dec. 1976 105 p refs
(Contract DI-14-0001-5108)
(PB-268777/0; W77-08602; OWRT-B-076-PA(2);
Research-Pub-97) Avail: NTIS HC A06/MF A01 CSCL 08H

Stormwater detention devices effective in reducing downstream problems as a result of urban development are discussed. Problems arising with these devices especially if they are not constructed or maintained properly were examined. Some devices were found to be environmentally more acceptable than others in certain areas. Urban runoff model refinement and reliability were also studied. GRA

N78-10549# Radiometric Technology, Inc., Wakefield, Mass.
MICROWAVE RADIOMETRIC SENSING OF SURFACE TEMPERATURE AND WIND SPEED FROM SEASAT Final Report
Ronald A. Porter and Ping-Tong Ho 22 Feb. 1977 167 p refs
(Grant NOAA-6-35-217)
(PB-270323/9; NOAA-77062710) Avail: NTIS HC A08/MF A01 CSCL 08J

An evaluation was performed on the effects of scattered solar radiation on sea surface brightness temperatures to be measured with a 6.6 GHz radiometer. An algorithm for deriving sea surface temperatures and wind speeds from brightness temperatures, has been developed for use on SEASAT. A set of conclusions and recommendations for further studies are presented. GRA

N78-10550# General Accounting Office, Washington, D. C. Energy and Minerals Div.
OUTER CONTINENTAL SHELF SALE 40: INADEQUATE DATA USED TO SELECT AND EVALUATE LANDS TO LEASE: DEPARTMENT OF THE INTERIOR Report to the Congress
28 Jun. 1977 65 p

(PB-269865/2; EMD-77-51) Avail: NTIS HC A04/MF A01 CSCL 10A

Selection and evaluation of outer continental shelf lands for leasing to develop domestic oil and natural gas resources is described. Ways to improve this Federal program are outlined. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N78-10551 Minnesota Univ., Minneapolis.
DEMAND FOR GASOLINE Ph.D. Thesis
Carol Dahl Norling 1977 159 p refs
Avail: Univ. Microfilms Order No. 77-19018

Market model estimates for gasoline were improved with particular emphasis on the gasoline price elasticity of demand. The model used included a demand for gasoline, a supply of gasoline, and a stock of autos equation. The complete model as closely as data permitted was estimated on United States, Canadian, and European economic community data using 2SLS. Econometric problems arose in this simultaneous system approach requiring improved econometric techniques. The question of which right hand side variables are exogenous was determined by using a Sims exogeneity test. Time series estimates were supplemented by cross section estimates for only the demand equation for United States state data, and Canadian provincial data. In the United States the time series point estimate for price elasticity of aggregate gasoline demand is - 1.545 and the cross section point estimate is 1.048. Dissert. Abstr.

N78-10552 Michigan Univ., Ann Arbor.
SYNTHETIC FUEL AND ELECTRIC CARS: A COST EFFECTIVENESS COMPARISON OF ALTERNATIVES FOR SUBSTITUTING COAL FOR OIL Ph.D. Thesis
David Parlett Hughart 1977 359 p
Avail: Univ. Microfilms Order No. 77-18032

The economic feasibility of battery-powered electric cars was compared with that of synthetic crude oil as a means of substituting coal for oil in the U.S. over the next several decades. Electric propulsion promises to be the best choice for uses in which a maximum daily driving range of 75 to 150 miles is acceptable. Development of economically viable electric cars with substantially longer ranges appears dependent on the use of a technology such as electrified highways or rapid battery exchanges that would extend range beyond that allowed by the energy storage capacity of a car's battery. A public policy analysis perspective was adopted: public expenditure criteria were used to indicate the appropriate goals of government intervention (R and D, incentive programs). The differences between private and social costs were estimated for the two options. Dissert. Abstr.

N78-10553 Michigan Univ., Ann Arbor.
WORLD SOURCES OF ENERGY AND NEW ENERGY RESOURCE DEVELOPMENT IN IRAN Ph.D. Thesis
Hooshang Ashraf 1977 177 p
Avail: Univ. Microfilms Order No. 77-18453

The depletion of existing non-renewable energy sources, particularly in Iran, represents a major constraint on the economic growth of developing nations, and sustained growth in industrialized countries. Current world-wide energy resources and reserves were identified and analyzed in regard to advantages and disadvantages of use. Of the fourteen alternative energy sources evaluated, solar, geothermal, and nuclear power were shown to have the best potential for development based on the cost of producing one kilowatt hour of electricity. The probable capital outlay necessary to construct and operate power plants using these technologies in Iran was determined. The costs were integrated with current levels of energy development and technology in that country to provide guidelines and a timetable for integrating geothermal, solar, and nuclear power within the energy sector there. Dissert. Abstr.

N78-10554* National Aeronautics and Space Administration. Pasadena Office, Calif.
PORTABLE LINEAR-FOCUSED SOLAR THERMAL ENERGY COLLECTING SYSTEM Patent
Charles G. Miller (JPL) and Jens G. Pohl, inventors (to NASA) (JPL) Issued 4 Oct. 1977 12 p Filed 28 Apr. 1976 Supersedes N76-26690 (14 - 17, p 2218) Sponsored by NASA (NASA-Case-NPO-13734-1; US-Patent-4,051,834; US-Patent-Appl-SN-680939; US-Patent-Class-126-271; US-Patent-Class-237-1A; US-Patent-Class-350-293; US-Patent-Class-350-299) Avail: US Patent Office CSCL 10A

A solar heat collection system is provided by utilizing a line-focusing device that is effectively a cylindrically curved concentrator within a protected environment formed by a transparent inflatable casing. A target, such as a fluid or gas carrying conduit is positioned within or near the casing containing the concentrator, at the line focus of the concentrator. The casing can be inflated at the site of use by a low pressure air supply to form a unitary light weight structure. The collector, including casing, concentrator and target, is readily transportable and can be used either at ground level or on rooftops. The inflatable concentrator can be replaced with a rigid metal or other concentrator while maintaining the novel advantages of the whole solar heat collection system.

Official Gazette of the U.S. Patent Office

N78-10555 Massachusetts Univ., Amherst.
SOLAR AND WIND HOME HEATING AND DOMESTIC HOT WATER SYSTEMS: ENERGY AND ECONOMICS STUDY Ph.D. Thesis
Ghazi Darkazalli 1977 273 p
Avail: Univ. Microfilms Order No. 77-13790

A development of a digital computer based methodology to calculate system performance and costs is presented. In addition to wind powered systems, solar, and combined wind and solar systems are considered in detail. The analysis is based on two separate computer programs: (1) an energy program that determines system performance as a function of subcomponent parameters and auxiliary energy requirements, and, (2) an economics program that calculates present and future (mass produced) costs of the wind and/or solar components and system. Complete details of all parts of the model, which is intended to be a general design tool for such systems, are presented. The results include a detailed series of runs based on hourly weather and solar data for a typical New England site, using an average and residence model. Also, additional runs are presented for other sites and residences. Dissert. Abstr.

N78-10556 Brown Univ., Providence, R. I.
A STUDY OF COPPER-SULFIDE/CADMIUM-SULFIDE PHOTOVOLTAIC CELLS BASED ON SULFURIZATION AND OTHER PROCESSES Ph.D. Thesis
Huey-Liang Hwang 1976 203 p
Avail: Univ. Microfilms Order No. 77-14132

A technique for fabrication of photovoltaic cells by the sulfurization process was developed. An efficiency of approximately 2% in direct sunlight was achieved. A comparison of properties of Cu(x)S/CdS solar cells, in which different methods were used to prepare the Cu(x)S layer, was done. The post-fabrication treatments, commonly used to improve the properties of Cu(x)S/CdS solar cells, were also studied. Cathodoluminescence was further developed as an analytical tool to study material properties. Dissert. Abstr.

N78-10557 Wisconsin Univ., Madison.
TRANSIENT PERFORMANCE OF SUPERCONDUCTIVE ENERGY STORAGE UNITS IN ELECTRIC POWER SYSTEMS Ph.D. Thesis
James Raymond Winkelman 1976 146 p
Avail: Univ. Microfilms Order No. 77-8126

The basic problem investigated is as follows: assume a system where the sending end and receiving end are separated by a transmission line of length lambda which is loaded to some

practical level, say surge impedance loading. A disturbance occurs somewhere in the load area and this load is dumped by opening a circuit breaker at the receiver end low voltage terminals. The interaction of the resultant oscillating system and a storage unit is investigated. Qualitative results are obtained by digital simulation and computer results are checked with analytical methods and with miniature network simulator verification where possible. The significant results are: (1) ac/dc converters can operate under transient conditions; (2) superconductive energy storage units can reduce peak transient overvoltages if a proper control scheme is used; (3) the control action required to produce the minimum overvoltage; and (4) superconductive energy storage units may also be used to limit steady-state voltages at its terminals.
Dissert. Abstr.

N78-10558 Polish Academy of Sciences, Warsaw.
ENERGY MANAGEMENT AS A SCIENTIFIC DISCIPLINE [GOSPODARKA ENERGETYCZNA JAKO DYSCYPLINA NAUKOWA]
Wlodzimierz Bojarski and Janusz Cofala 4 Feb. 1977 163 p refs In POLISH
Avail: Issuing Activity

The domain of energy management research is defined. The divisions of this research are classified, the intermeshing of the discipline with other technical, natural, and social sciences is specified. The substantive and organizational structure of the national fuel and energy system is characterized. The factors integrating the system are enumerated and a general numerical characterization is provided. The central problem at present is optimizing the process of changing the structure of the national energy system in the long range taking into account all interrelationships and uncertainties. The general state of development of national and foreign scientific centers and international scientific organizations occupied with problems of energy management is described. The large amount of disintegrated organization and the structure of subsystems of national energy systems receive special attention. The need for creating a central research institution for integrating and stimulating economic system research in the domain of energy management is emphasized. Author

N78-10559*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SOLAR POWER SATELLITE CONCEPT EVALUATION. VOLUME 1: SUMMARY Progress Report, Jul. 1976 - Jun. 1977
Jun. 1977 130 p
(NASA-TM-74820; JSC-12973-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 10A

A program was developed to determine the technical feasiblity of a satellite solar power station. The space construction, maintenance, and transport systems are discussed. Environmental factors, in addition to manufacturing, natural resources, and energy were considered. Cost estimates and alternative systems are outlined. G.D.H.

N78-10560# Maxwell Labs., Inc., Woburn, Mass.
STUDY OF HIGH POWER, HIGH PERFORMANCE PORTABLE MHD GENERATOR POWER SUPPLY SYSTEMS Final Report, Jun. 1975 - Mar. 1976
Otto K. Sonju and Joseph Teno Aug. 1976 250 p refs
(Contract F33615-75-C-2069)
(AD-A040381; AFAPL-TR-76-87) Avail: NTIS HC A11/MF A01 CSCL 10/2

This report presents the results of a study program undertaken to investigate and evaluate high power, lightweight, MHD generator systems. Detailed design studies of various MHD generator systems for use as a prime source in the range of power from 10 to 50 MW operating for some 63 to 120 seconds total run time were performed. Both single and multipulse operations were considered. A relatively wide range of operating parameters were considered and eight specific point designs were investigated. A three-year development program for a lightweight ground based prototype MHD generator system was defined. The design of a high performance, compact MHD generator system involves the consideration and trade-off of a number of the MHD generator operating parameters including the power density, the efficiency, the magnet flux density, the length to diameter ratio of the channel, the channel configuration, the boundary layers, the conductivity, and the various flow parameters. Once compactness and optimization have been achieved in this regard, the matter of lightweight components becomes an important consideration. In the present study, trade-off studies in terms of the operating parameters were conducted, and the designs of lightweight components were studied and evaluated. Lightweight rocket-type combustors, both using solid and liquid fuels, exist and were evaluated in terms of performance in an MHD generator system. The design of compact, lightweight, superconducting magnets and generator channels were evaluated. A small lightweight MHD channel is currently being fabricated. GRA

N78-10561# Bechtel Corp., San Francisco, Calif.
COAL GASIFICATION STUDY HANDBOOK Final Report
Apr. 1977 102 p
(Contract N68305-76-C-0009)
(AD-A042385) Avail: NTIS HC A06/MF A01 CSCL 21/4

The purpose of this handbook is to provide: first, a procedure for evaluating the costs of a coal gasification plant in terms of the capital investment and operating costs. These are to be sensitive to several parameters defining coal, fuel gas, and sulfur emissions; second, a procedure for the derating of Navy base boilers, to reflect the change in performance resulting from introduction of fuel gas in place of coal or oil. The gas plant analysis is based in part on a detailed analysis of the gas treatment section of the plant. The remaining part of the plant performance is based on conventional stoichiometry and near approach to equilibrium in the gas production section. The boiler derating method is based on observations of the relative contribution to heat transfer made by radiation and convection, and on conventional relations describing these transfer processes.
Author (GRA)

N78-10562# Power Conversion, Inc., Mount Vernon, N. Y.
MANUFACTURING METHODS AND TECHNOLOGY FOR HERMETICALLY SEALED LITHIUM SO2 CELL BATTERIES Quarterly Report, 25 Jun. - 30 Sep. 1976
M. G. Rosansky and R. M. Tedeschi Oct. 1976 173 p refs
(Contract DAAB07-76-C-0042)
(AD-A042506; ECOM-76-0042-Q-01; QR-1) Avail: NTIS MF A01 CSCL 10/3

Effort has commenced on the MM and T program to establish the fabrication techniques and requirements necessary to meet hardware production levels as specified in the subject contract. A PERT/TIME NETWORK was developed to define specified management and engineering objectives within the overall program. Initial hermetic cell and battery component design has been developed to meet and/or exceed all performance, safety and environmental specifications. The basic system concepts for electrolyte fill and dispensing, core winding, cathode/anode manufacture and hermetic closure have been defined to permit subsequent integration within an operational production line. Interface with automated equipment manufacturers will continue to define specific machine elements and initiate hardware procurement within the time frame of the PERT/TIME NETWORK. Author (GRA)

N78-10563# Purdue Univ., Lafayette, Ind.
MATERIAL SELECTION CONSIDERATIONS FOR FLUORIDE THERMAL ENERGY STORAGE CONTAINMENT IN A SODIUM HEAT PIPE ENVIRONMENT Final Report, 1 Jun. - Aug. 1976
Dean L. Jacobson May 1977 34 p refs Prepared in Cooperation with Arizona State Univ., Tempe
(Contract F33615-74-C-2014)
(AD-A042389; AFAPL-TR-77-9) Avail: NTIS HC A03/MF A01 CSCL 10/3

This contract involved a literature survey to determine the state-of-the-art of materials in a high temperature Na and vacuum environment as applied to thermal energy storage. It was found that little information exists for materials or heat pipes in the high temperature (1400 K) Na or vacuum environments. Program recommendations are to perform life tests on candidate materials and Na heat pipes with post test corrosion analyses. Na wicking parameter must be determined experimentally for accurate heat pipe design. Author (GRA)

N78-10564# Naval Surface Weapons Center, White Oak, Md.
MEASUREMENT OF BATTERY SEPARATOR RESISTANCES IN LOW IMPEDANCE CONDUCTIVITY CELLS BY A. C. BRIDGE TECHNIQUES Progress Report
W. P. Kilroy and C. T. Moynihan 26 Apr. 1977 23 p
(SF43431302)
(AD-A042182; NSWC/WOL/TR-77-47) Avail: NTIS
HC A02/MF A01 CSCL 10/3

Measurement of the resistance of battery separator membranes is frequently accomplished by taking the difference between the resistances of an electrolyte filled conductivity cell with and without the separator inserted between the electrodes. For low resistance separators this may involve measurements of impedances of a few tenths of an ohm. It is shown via equivalent circuit analysis and experimental data on a low impedance cell filled with 45% aqueous KOH solution that ac bridge measurements of separator resistances can be seriously in error if proper account is not taken of electrode impedance. Author (GRA)

N78-10565# Eureka Advance Science Corp., Bloomington, Ill.
HIGH ENERGY DENSITY PELLETIZED ALUMINUM CHLORINE THERMAL BATTERIES Final Report, 15 May - 15 Dec. 1976
David M. Ryan and L. C. Bricker 15 Apr. 1977 116 p refs
(Contract F33615-76-C-2080; AF Proj. 3145)
(AD-A042558; AFAPL-TR-77-12) Avail: NTIS
HC A06/MF A01 CSCL 10/3

The Eureka Advance Science Corporation entered into a contract to engineer the development of a thermal battery based upon an electrochemical cell developed at the Frank J. Seiler Research Laboratory. This cell utilizes aluminum or lithium-aluminum alloy as its anode, a Cab-O-Sil/NaAlCl4 mixture as anolyte, and a mixture of anolyte, MoCl5 and graphite as cathode. Engineering research at the Eureka Advance Science Corporation was undertaken to develop a profile of the operating characteristics of a battery utilizing this cell, and to investigate the feasibility of manufacturing such a battery. Commercially available NaAlCl4 was found to be unsuitable for cell preparation. The synthesis of NaAlCl4 was carried out at FJSRL and at Eureka, and both synthesized materials were found satisfactory for the production of anolyte and catholyte. Lithium-aluminum alloys of 20 w/o Li and 28 w/o Li were investigated, and both were found to be suitable anode materials. GRA

N78-10566# Energy Research Corp., Danbury, Conn.
FUEL CELL STACKS Final Technical Report
S. G. Abens, B. S. Baker, and I. Michalko Jun. 1977 73 p
(Contract DAAK02-74-C-0367)
(AD-A042315; ERC-7396-4) Avail: NTIS HC A04/MF A01
CSCL 10/2

Manufacturing methods and techniques for phosphoric acid fuel cell stack production were developed. Electrodes, matrices, and bipolar gas distribution plates for cells with an active area of 0.4 sq. ft. were produced and tested. Assembly and testing of 2-, 10-, and 35-cell stacks was performed. Stacks were operated at 320F for up to 4,000 hours, and tolerance to CO was demonstrated. Author (GRA)

N78-10567# Army Construction Engineering Research Lab., Champaign, Ill.
TECHNOLOGY EVALUATION OF ARMY-SCALE WASTE-TO-ENERGY SYSTEMS
S. A. Hathaway and R. J. Dealy Jul. 1977 87 p refs
(DA Proj. 4A7-62719-AT-41)
(AD-A042578; CERL-IR-E-110) Avail: NTIS
HC A05/MF A01 CSCL 13/1

This investigation evaluated current and emerging technologies for the converting waste to energy in applications scaled for use on Army fixed facilities and installations. Technologies reviewed include: mass burning of wastes in package (modular) and field-erected systems; use of refuse-derived fuel (RDF) in new combustion capital and as a supplementary fuel in existing Army-scale central steam generators; pyrolytic conversion of waste to a gaseous and liquid fuel; and anaerobic digestion of wastes to a fuel gas. The report includes application of a rating system for candidate technologies which considers dependability, practicability, conservation, environmental compatibility, economics, and length of operational history. Use of package waste-to-energy systems and use of RDF as a supplementary boiler fuel are treated in detail. Fully satisfactory methods of surveying installation solid waste to determine energy-recovery system design points are lacking, and currently used methods can result in misapplication of capital. Combustion of unprocessed and minimally processed (Once-shredded) solid waste in field-erected integrated waterwall combustors equipped with mechanical stokers is currently the superior energy recovery technology. Anaerobic digestion and pyrolytic conversion were found to be unproven but developing. GRA

N78-10568# Mallory Battery Co., Tarrytown, N. Y.
PRIMARY LITHIUM ORGANIC ELECTROLYTE BATTERY BA - 5598 ( )/U Final Report, 1 Dec. 1972 - Apr. 1976
S. Kravetz and N. Raman Jun. 1977 63 p
(Contract DAAB07-72-C-0288; DA Proj. 1L7-63702-DG-10)
(AD-A042799; ECOM-72-0288-F) Avail: NTIS
HC A04/MF A01 CSCL 10/3

This report summarizes the program which was aimed at developing a Primary Lithium Organic Electrolyte Battery capable of operating over a temperature range of -40 F. to 125 F. A 15.0 volt battery was designed with hermetically sealed cells to withstand high temperature storage conditions and to operate simulated field equipment pulse loads. The cells are designed for energy densities up to 150 WH/LB at room temperatures at approximately 0.4A drains. The contract was modified to incorporate a new hermetically sealed cell to replace the original compression sealed cell. In addition to preventing leakage of SO2 during storage at 160 F., the cell design self venting mechanism enhanced the safety characteristics associated with Lithium Organic Primary Batteries. The battery nomenclature and configuration was modified in order to meet the Technical Requirements of the BA 5598 ( )/U Battery, which was reduced in size and weight to as much as 50% as compared to the original BA - 584 ( )/U Battery. Author (GRA)

N78-10569# Stein (Richard G.) and Associates, New York.
RESEARCH DESIGN CONSTRUCTION AND EVALUATION OF A LOW ENERGY UTILIZATION SCHOOL, PHASE 2
R. G. Stein, C. Stein, and P. F. Deibert 31 Mar. 1977 196 p
(Grant NSF AER-73-0357-A02)
(PB-269407/3; NSF/RA-770032) Avail: NTIS
HC A09/MF A01 CSCL 13A

The development of a lighting program is discussed. This includes the evaluations of high-efficiency commercially available light fixtures; design, construction, and testing of fluorescent adaptors for buildings presently lighted with incandescent fixtures; modifications to ventilation systems; and the design of a filmstrip to involve the teachers and students in the school buildings in an energy conservation program. GRA

N78-10570# Honeywell, Inc., Horsham, Pa. Power Sources Center.
LITHIUM INORGANIC ELECTROLYTE BATTERY INVESTIGATION Final Report, 9 Sep. 1974 - 31 Jan. 1977
D. L. Chua and C. R. Walk Wright-Patterson AFB, Ohio AFAPL Apr. 1977 74 p
(Contract F33615-74-C-2071; AF Proj. 3145)
(AD-A043364; AFAPL-TR-77-21) Avail: NTIS
HC A04/MF A01 CSCL 10/3

Lithium Thionyl Chloride Batteries were investigated for three potential applications and their performance measured under simulated loads. The problem of passivation during storage was investigated and additions of 5 weight percent sulfur dioxide were found beneficial in reducing the effects of passivation. Some preliminary capacity retention and safety data were generated. Three sizes of cells (1.6, 165, and 350 ampere hours) were fabricated and tested. Performance was 130 watt hours/lb and 11.8 watt hours/cu in. for the 1.6 Ah cells. The large 531 ampere hour cells delivered over 280 Wh/lb and 19 Wh/cu in. Some information was generated on the nature of the film formed on the lithium electrode during storage.
Author (GRA)

N78-10571# Simulation Physics, Inc., Bedford, Mass.
STRESS FREE APPLICATION OF GLASS COVERS FOR RADIATION HARDENED SOLAR CELLS AND ARRAYS Final Technical Report, Jan. 1974 - Jul. 1976

Allen R. Kirkpatrick, Wallace S. Kreisman, and John A. Minnucci Wright-Patterson AFB, Ohio AFAPL May 1977 105 p refs (Contract F33615-74-C-2001)
(AD-A043854; AFAPL-TR-77-28) Avail: NTIS HC A06/MF A01 CSCL 10/2

This report describes a two and one half year program to develop a practical integral protective cover for silicon solar cells. The report discusses the electrostatic bonding process, methods for its utilization and selection of a satisfactory glass cover material for use with the process. Excellent results have been achieved in demonstrating integral covers 150 micrometers to more than 500 micrometers thick onto several types of 2 x 2 cm cells with SiO sub x or Ta2O5 antireflective coatings. The most difficult problem in applying electrostatically bonded covers to silicon solar cells involves the raised metallization pattern on the otherwise essentially planar cell surface. Cover glasses can either be plastically deformed around the material pattern or can be mechanically grooved to accept the grid material. The plastic deformation approach requires higher bonding process temperatures, to as high as 600 C, but should be more practical in production. Representative integral cover cell samples have exhibited excellent stability under environmental testing. An automated facility has been constructed to demonstrate production feasibility for application of integral covers. Cells covered using the automated facility have exhibited some contact integrity problems which have been identified as associated with the presence of an oxidizing atmosphere during bonding. Facility correction will be required. The electrostatic bonding process shows promise for major technical and economic advantages over conventional glued covers. Author (GRA)

N78-10572# Spectrolab, Inc., Sylmar, Calif.
HIGH EFFICIENCY SOLAR PANEL (HESP) Final Report, 1 Jun. 1975 - 15 Jun. 1977
John Scott-Monck, Charles Gay, Paul Stella, and Frank Uno Wright-Patterson AFB, Ohio AFAPL 1 Jul. 1977 145 p refs (Contract F33615-75-C-2)
(AD-A043382; AFAPL-TR-77-36) Avail: NTIS HC A07/MF A01 CSCL 10/2

A Family of high efficiency, weldable silicon solar cells, incorporating every feature of advanced technology developed in the past four years, was produced and subjected to space qualification testing. This matrix contained both field and non-field cells ranging in thickness from 0.10 mm to 0.30 mm, and in base resistivity from nominal two to one hundred ohm-cm. Initial power outputs as high as 20 mW/sq.cm (14.8% AMO efficiency) were produced by certain cell types within this group. All these cells had certain common features; a selectively etched front surface which reduced reflection losses, tantalum-palladium-silver front contacts, chromium-palladium-silver back contacts, junction depths approx 0.10 micrometers, and a tantalum pentoxide antireflection coating. For the field cells, acceptor doping was accomplished using a screen printed aluminum paste source. The baseline cell, which was 0.23 mm thick, nominal two ohm-cm, non-field type was produced in three sizes, 2 x 2 cm, 2 x 4 cm and 2 x 6 cm, the others in 2 x 2 cm form. The 2 x 2 cm baseline cell underwent a complete space qualification test cycle including all the typical environmental requirements such as temperature-humidity and thermal cycling. The baseline cell and eleven other types were tested to electron fluence levels of 1 x 10 to the 16th power equivalent 1 MeV electrons/sq.cm, fission spectrum neutron fluence levels of 1 x 10 to the 13th power equivalent 1 MeV neutrons/sq.cm, and were characterized with respect to their radiometric properties. GRA

N78-10573# National Bureau of Standards, Washington, D. C. Inst. for Materials Research.
MATERIALS FOR FUEL CELLS Annual Report, Jan. - Dec. 1976
L. H. Bennett, M. I. Cohen, A. L. Dragoo, A. D. Franklin, and A. J. McAllister May 1977 64 p refs
(PB-269518/7; NBSIR-77-1270) Avail: NTIS HC A04/MF A01 CSCL 10B

Transition metal carbides, borides and nitrides were examined with respect to stability and to catalytic oxidation of H2 as non-precious substitutes for Pt as fuel electrocatalysts. An automated system for electrochemical analysis was designed and built, using digital control and readout techniques to perform analog measurements. Studies of CeO2:Y2O3 ceramic electrolytes were designed to measure the influence of annealing and prolonged current passage on electrical properties of these materials. Work on a high temperature facility for these experiments and preparation of CeO2:Y2O3 ceramic specimens is described. GRA

N78-10574# Price Waterhouse and Co., Washington, D. C. Office of Government Services.
DIGEST OF FEDERAL REGISTERS
Mar. 1977 301 p
(Contract FEA-CR-06-70002-00)
(PB-270153/0; FEA/H-77/280) Avail: NTIS HC A14/MF A01 CSCL 05C

A compilation of the changes to Refiner and Reseller Pricing Regulations as they appeared in the Federal Register is presented. Included are the preambles and rulings in addition to the actual regulation language. GRA

N78-10575# Little (Arthur D.), Inc., Cambridge, Mass.
SOLAR AIR-CONDITIONING STUDY Final Report
Richard Merriam Apr. 1977 144 p refs
(Contract N68305-76-C-0029; zf57571001)
(AD-A043951; ADL-C-79679; CEL-CR-77.018) Avail: NTIS HC A07/MF A01 CSCL 13/1

The state-of-the-art of solar cooling is evaluated to determine the near term performance potentials and life-cycle costs of the most promising approaches. The heat actuated absorption cycle, Rankine cycle, and desiccant dehumidification cycle are examined. The principles of operation are described, performance coefficients are reviewed, operating constraints are examined, and the commercial status of each approach is evaluated. An analysis of the major solar cooling demonstrations (as of 1976) is carried out. Savings-to-investment ratios are calculated for solar cooling systems in buildings in seven locations within the United States. Author (GRA)

N78-10576# Energy Research and Development Administration, Washington, D. C. Div. of Solar Energy.
SOLAR ENERGY IN AMERICA'S FUTURE: A PRELIMINARY ASSESSMENT
Mar. 1977 126 p refs
(DSE/115-1) Avail: NTIS HC A07/MF A01

A study of potential roles that solar energy technologies could have for meeting U.S. energy needs over the next 45 years is documented. Computer simulations of different energy supply projections were developed by varying the input parameters of energy demand and energy costs. Some of these projections were chosen to be developed into broader scenarios-that is, richer scripts of the future. First, the implementation measures required to realize these scenarios were delineated. Then, the economic, socio-economic, socio-political, and environmental issues associated with different energy futures were identified, and these issues were compared among the three scenarios. Finally, six major societal issues were synthesized from an analysis of the scenarios. These issues and the three scenarios were evaluated from the perspectives of individuals in different perceptual frames of reference. ERA

N78-10577# Energy Research and Development Administration, Washington, D. C. Div. of Solar Energy.
SOLAR PROGRAM ASSESSMENT: ENVIRONMENTAL FACTORS
Mar. 1977 71 p refs
(ERDA-77-47/5) Avail: NTIS HC A04/MF A01

The major environmental, safety, and social/institutional issues associated with the further development of solar total energy systems (STES) are presented and prioritized. The basic concepts of STES are reviewed, as are their resource requirements. The potential effects of these systems on the full range of environmental concerns are discussed in terms of their relative significance and possible solutions. Only those impacts unique to the solar portion of the technology are discussed in depth. An environmental work plan is presented, listing R and D proposals and a NEPA work plan that might help clarify and/or alleviate specific environmental problems. ERA

N78-10578# Alaska Univ., Fairbanks.
WIND POWER POTENTIAL OF ALASKA. PART 2: WIND DURATION CURVE FITS AND OUTPUT POWER ESTIMATES FOR TYPICAL WINDMILLS
Tunis Wentink, Jr. Aug. 1976 92 p
(Contracts E-76-S-06-2229)
(RLO-2229-T12-76/1-Pt-2; UAG-R-240-Pt-2) Avail: NTIS HC A05/MF A01

An empirical analytical function (F1) and the Weibull function (F3) were compared for use in casting measured long-term wind speed frequency data in the form of the wind speed duration curves. Data from 18 Alaskan locations were used in the 248 cases treated. The fitted duration curves were coupled with the instantaneous power vs. wind speed characteristics for three wind energy conversion systems (WECS) to predict the probable monthly and annual mean energy productivity and power levels of the WECS. The validity of use of the long-term average wind speed as a key parameter in wind work is demonstrated. ERA

N78-10579# Dynatherm Corp., Cockeysville, Md.
HEAT PIPE CENTRAL SOLAR RECEIVER Semiannual Progress Report, 1 Mar. - 31 Aug. 1976
Walter B. Bienart and D. A. Wolf Nov. 1976 120 p refs
(Contract EY-76-C-02-2839)
(COO-2839-1) Avail: NTIS HC A06/MF A01

The concept is based on the use of heat pipes to transfer the concentrated solar flux to the gaseous working medium of a Brayton cycle conversion system. An open air cycle with recuperator and a turbine inlet temperature of 800 C (approximately 1500 F) was selected as the optimum choice. It yields a conversion efficiency of approximately 32 percent and an overall solar-to-electric efficiency of 20 percent. Three potential receiver configurations have been identified, two of them being of the cavity type and one being an external receiver. The required thermal diffuser heat pipes use liquid metal as the working fluid. The optimum size is approximately 5 cm in diameter and 2 to 3 cm in length. The design axial heat flux is 10 MW/m square meter which corresponds to a heat transfer rate of 20 kW per heat pipe. The theoretical foundations of these heat pipes have been developed and subscale prototypes have been tested successfully. The radial and axial heat fluxes of the prototypes met and exceeded the requirements for the full-scale heat pipes. ERA

N78-10580# Illinois Univ., Urbana. Center for Advanced Computation.
STRUCTURAL DESCRIPTIONS OF ALTERNATIVE ENERGY FUTURES
C. W. Bullard 1977 6 p refs Sponsored by ERDA
(COO-2865-7) Avail: NTIS HC A02/MF A01

Characterizing key structural features of a nation's economic system was emphasized in regard to long range energy policy analysis. It was shown that energy analysis techniques are well suited to such applications, particularly over time horizons beyond the reach of econometric methodologies. Tradeoffs between aggregation and uncertainty were discussed as a function of time horizon. For alternative energy futures, special attention was given to the assessment of impacts on lifestyles, technology, and employment. Author

N78-10581# Teledyne Energy Systems, Timonium, Md.
SELENIDE ISOTOPE GENERATORS
T. E. Hammel and W. E. Osmeyer 1977 7 p
(Contract EX-76-C-16-3077)
(CONF-770302-1) Avail: NTIS HC A02/MF A01

Predicted performance characteristics were established, through design studies, for radiosotope thermoelectric generators using selenide thermoelectric materials. These materials exhibited an efficiency growth potential as a function of improvements in both material composition and increased operating temperature. These performance characteristics were established for time intervals: 1981, 1983, and 1985. The 1981 generator was designed for the Jupiter orbiter probe mission and exhibits an efficiency of 10.5 percent. The 1983 system promises efficiency of 11 percent, and the 1985 system, 13.5 percent. Author

N78-10582# Israel Atomic Energy Commission, Tel Aviv.
GUIDELINES FOR FORECASTING ENERGY DEMAND
T. Sonnino Nov. 1976 22 p refs
(IA-1327) Avail: NTIS (US Sales Only) HC A02/MF A01; ERDA Depository Libraries

Four methodologies for forecasting energy demand are reviewed after considering the role of energy in the economy and the analysis of energy use in different economic sectors. The special case of Israel is considered throughout, and some forecasts for energy demands in the year 2000 are presented. An energy supply mix that may be considered feasible is proposed. ERA

N78-10583# Westinghouse Electric Corp., Pittsburgh, Pa.
STUDY OF THE MANUFACTURING COSTS OF LEAD-ACID BATTERIES FOR PEAKING POWER Final Report, period ending Oct. 1976
Dec. 1976 65 p
(Contract EX-76-C-01-2114)
(CONS/2114-2) Avail: NTIS HC A04/MF A01

A postulated 1000 MWh per year lead-acid battery business was studied which is dedicated to supplying a single design of 40 MWh peaking power batteries to electric utilities. State-of-the-art industrial technology is assumed, but the manufacturing facility and business organization is tailored to the one product. Analysis of the product costs and business expenses associated with such an operation indicates that substantially lower selling prices can be realized as compared with normal industrial battery pricing. ERA

N78-10584# Electrochemical Technology Corp., Seattle, Wash.
IMPROVEMENTS IN ENERGY EFFICIENCY OF INDUSTRIAL ELECTROCHEMICAL PROCESSES Final Report
T. R. Beck Jan. 1977 229 p refs
(Contract W-31-109-eng-38)
(ANL/OEPM-77-2) Avail: NTIS HC A11/MF A01

Industrial electrochemical processes for the purpose of identifying methods of improving energy efficiencies were studied. A historical perspective is given on energy usage by the aluminum and chlor-alkali industries. Past actions affecting energy efficiency are described as a background for discussing possible future improvements. Energy flow diagrams are provided for processes, showing the components and efficiency of energy usage. Possible methods of improving energy efficiency are then described. Emphasis is placed on aluminum reduction and manufacture of chlorine and sodium hydroxide since these are the most important of the electrochemical industries in terms of energy use and possible energy savings. ERA

N78-10585# Argonne National Lab., Ill.
DESIGN AND COST STUDY OF NICKEL-ZINC BATTERIES FOR ELECTRIC VEHICLE Final Report
M. Klein and D. Dube 1 Oct. 1976 132 p
(Contract W-31-109-eng-38)
(ANL-K-76-3541-1) Avail: NTIS HC A07/MF A01

A battery module configuration consisting of four 325-Ah cells was selected. A 24-kWh battery would be made up of 12 such modules. The key design parameter is operation current density. An energy density of 2.1 Wh/cu in. and 35 Wh/lb was obtained. A flow diagram was drawn for the manufacturing process. Pilot plant requirements are discussed. ERA

N78-10586# Oak Ridge National Lab., Tenn.
BOILING HEAT TRANSFER IN A BENCH-SCALE MOLTEN-SALT THERMAL ENERGY STORAGE DEVICE
R. M. Canon and J. D. Hewitt May 1977 36 p
(Contract W-7405-eng-26)
(ORNL/TM-5689) Avail: NTIS HC A03/MF A01

Overall boiling heat transfer coefficients were determined experimentally for a proposed thermal energy storage salt (NaNO3) in a vertical-tube boiler for the following range of variables: (1) water flow (lb/hr/sq ft) = 840-2800; (2) steam temperature (deg F) = 295-475; (3) steam pressure (psi) = 50-500; and (4) heat flux (Btu/hr/sq ft) = 2100-6700. Tube and vessel heat fluxes and energy recovery fractions were also determined. ERA

N78-10587# California Univ., Livermore. Lawrence Livermore Lab.
FIBER-COMPOSITE SYSTEMS FOR ENERGY-STORAGE FLYWHEELS

L. S. Penn and E. S. Jessop 31 Dec. 1976 13 p refs Presented at the 22nd Natl. SAMPE Symp./Exhibition, San Diego, Calif, 26-28 Apr. 1977
(Contract W-7405-eng-48)
(UCRL-78610; Conf-770407-2) Avail: NTIS HC A02/MF A01

Fiber-composite systems for use in energy-storage flywheels (Kevlar 49/epoxy, Kevlar 29/epoxy, S2-glass/epoxy, and E-glass/epoxy) were studied. The performances of the four materials were compared and a relationship between results of conventional materials tests and spin tests was obtained. For each material, tensile tests of epoxy-coated strands, hydroburst tests of NOL rings, and hydroburst and spin tests of thin-rim composite rotors about 406 mm in diameter were performed. The results of the rotor and NOL ring hydroburst tests were the same as the results of the spin tests. For the thin-rim rotor design, hydroburst tests of the rotor or of the NOL ring can be used to predict spin performance. In terms of energy density, Kevlar 49/epoxy ranked highest, but in terms of energy density per unit cost, E-glass/epoxy was best. ERA

N78-10588# Oak Ridge National Lab., Tenn.
ASSESSMENT OF HIGH TEMPERATURE NUCLEAR ENERGY STORAGE SYSTEMS FOR THE PRODUCTION OF INTERMEDIATE AND PEAK-LOAD ELECTRIC POWER
E. C. Fox, L. C. Fuller, and M. D. Silverman 18 Apr. 1977 56 p refs
(Contract W-7405-eng-26)
(ORNL/TM-5821) Avail: NTIS HC A04/MF A01

An evaluation of thermal storage systems is made for several reactor concepts and economic comparisons are presented with conventional storage and peak power producing systems. It is concluded that dedicated nuclear storage has a small but possible useful role in providing intermediate and peak-load electric power. ERA

N78-10589# Brookhaven National Lab., Upton, N. Y.
PROSPECTS OF USING SUPERCONDUCTING dc LINES
V. E. Ignatov and A. V. Misulin 1976 10 p refs Transl. into ENGLISH from Krizhizhanovskij Ehnergeticheskij Inst., Moscow (USSR)
(BNL-TR-637) Avail: NTIS HC A02/MF A01

The storage of electric power in modern energy systems is described. A solution is proposed for combining the transmission and storage of electric power in superconducting dc power transmission lines in which cryotron-type transformers are connected to the superconducting transmission line and operated in parallel with the main semiconductor transformers. ERA

N78-10590# General Accounting Office, Washington, D. C. Energy and Minerals Div.
DOMESTIC ENERGY RESOURCE AND RESERVE ESTIMATES: USES, LIMITATIONS, AND NEEDED DATA
17 Mar. 1977 59 p
(PB-268966/9; EMD-77-6) Avail: NTIS HC A04/MF A01 CSCL 08I

The government's data on domestic resources and reserves of crude oil, natural gas, uranium, and coal were studied. It was found that estimates of resources and reserves of these fuels can be greatly improved. GRA

N78-10591# MetroStudy Corp., Washington, D. C.
COMMERCIAL SPACE: POLICY ANALYSIS OF PROFITABILITY OF RETROFIT FOR ENERGY CONSERVATION Final Report
John Williams, Dennis Eisen, Albert Beverly, and Richard Murray Jun. 1976 152 p refs
(Contract FEA-CO-04-50279)
(PB-269189/7; FEA/D-77/187) Avail: NTIS HC A08/MF A01 CSCL 13A

The formulation of policy alternatives to promote the retrofit of commercial buildings for energy conservation was investigated. The study design called for: (1) the collection of detailed financial data and building characteristics; (2) the identification of rational retrofit measures individually developed for selected buildings with an estimate of cost and energy saving; (3) a detailed analysis of the financial projection for each building over its expected life, for each retrofit option and for three selected policy alternatives; (4) the description of commercial space in 12 cities as derived from existing studies; and (5) the preparation of detailed inventories of the commercial space in 2 cities. GRA

N78-10592# Faucett (Jack) Associates, Inc., Chevy Chase, Md.
STATE-OF-THE-ART OF FUNCTIONAL USE DATA MEASURING ENERGY CONSUMPTION IN THE COMMERCIAL SECTOR Final Report
Hilary A. Kaufman and William Anderson Apr. 1977 82 p refs
(Contract FEA-P-03-77-4390-0)
(PB-269906/4; JACKFAU-77-173-1; FEA/B-77/224) Avail: NTIS HC A05/MF A01 CSCL 10A

Estimates of the amount of energy consumed in 1974 for each of the six functional uses in eight commercial industries are presented. The methodology used to estimate the overall energy consumption and to document the availability of information concerning functional use patterns of energy consumption is evaluated. GRA

N78-10593# Gruy Federal, Inc., Arlington, Va.
PRICING EFFECTS ON FRONTIER OIL PRODUCTION Final Report
20 Jun. 1977 273 p
(Contract FEA-CR-05-60813-00)
(PB-269807/4; FEA/H-77/223) Avail: NTIS HC A12/MF A01 CSCL 05C

A study was designed to analyze and evaluate the price effect on the rate and cost of converting the resource potential of frontier regions to produced oil. The frontier regions studied were: (1) Alaska - Onshore (Regions 18 and 19); (2) Lower 48 - Onshore (Deep Horizon); (3) Alaska - Offshore (Regions 20 and 21); (4) Pacific Offshore (Region 22); (5) Gulf of Mexico (Region 24). A computer model was developed to assess probable exploitation scenarios of oil reserves in these regions. GRA

N78-10594# Price Waterhouse and Co., Washington, D. C. Office of Government Services.
REFERENCE GUIDE TO CHANGES IN RESELLER PRICING REGULATIONS AND RULINGS
Mar. 1977 54 p
(Contract FEA-CR-06-70002-00)
(PB-270152/2; FEA/H-77/279) Avail: NTIS HC A04/MF A01 CSCL 05C

A reference guide was written to assist the FEA auditor in understanding the history of the FEA resellers pricing regulations. It is written in nonlegal language for easy reading. The reference guide presents a discussion of main topics within the regulations (crude oil costs, nonproduct costs, etc.) followed by time flow charts. The discussions and charts offer an overview of the rules and changes. GRA

N78-10595# Price Waterhouse and Co., Washington, D. C. Office of Government Services.
REFERENCE GUIDE TO CHANGES IN REFINER AND RESELLER PRICING REGULATIONS AND RULINGS
Mar. 1977 149 p
(Contract FEA-CR-06-77-4463-0)
(PB-270151/4; FEA/H-77/278) Avail: NTIS HC A07/MF A01 CSCL 05C

The reference guide was written to assist the FEA auditor in understanding the history of the FEA refiners and resellers pricing regulations. It is written in nonlegal language for easy reading. The Reference Guide presents a discussion of main topics within the regulations (crude oil costs, non-product costs, etc.) followed by time flow charts. The discussions and charts offer an overview of the rules and changes. GRA

N78-10596# Foster Associates, Inc., Washington, D.C. Energy Div.
IMPACT OF NATURAL GAS SHORTAGE ON MAJOR INDUSTRIAL FUEL-BURNING INSTALLATIONS. VOLUME 1: TEXT
J. A. Brickhill Mar. 1977 138 p refs 3 Vol.
(Contract EPA-68-02-1452)
(PB-269365/3; EPA-450/3-77-017a-Vol-1) Avail: NTIS

HC A07/MF A01; also available in set of 3 reports PC E07, PB-269364-SET CSCL 10A

The impact of natural gas shortages on major fuel burning installations was analyzed. The availability of natural gas through 1980 for major fuel burning installations, the alternate fuel burning capability of these plants, the need for alternate fuels such as fuel oil and coal to offset the gas shortages and the estimated increase in sulfur dioxide and particulate emissions from the burning of these alternate fuels were estimated. The narrative for the analysis of natural gas shortages on the gas fired plants is presented, with pertinent findings and conclusions. GRA

N78-10597# Foster Associates, Inc., Washington, D.C. Energy Div.

IMPACT OF NATURAL GAS SHORTAGE ON MAJOR INDUSTRIAL FUEL-BURNING INSTALLATIONS. VOLUME 2: SCHEDULES (DATA AND TABLES)

J. A. Brickhill Mar. 1977 95 p refs 3 Vol.
(Contract EPA-68-02-1452)
(PB-269366/1; EPA-450/3-77-017-b-Vol-2) Avail: NTIS HC A05/MF A01; also available in set of 3 reports, PC E07, PB-269364-SET CSCL 10A

The impact of natural gas shortages on major fuel burning installations was analyzed. Gas curtailments plans, natural gas supplies, FEA survey data for MFBI and applicable state air pollution control regulations were reviewed. The availability of natural gas through 1980 for major fuel burning installations, the alternate fuel burning capability of these plants, the need for alternate fuels such as fuel oil and coal to offset the gas shortages and the estimated increase in sulfur dioxide and particulate emissions from the burning of these alternate fuels were estimated. Schedules of data summaries for the natural gas fired plants are presented. GRA

N78-10598# Foster Associates, Inc., Washington, D.C. Energy Div.

IMPACT OF NATURAL GAS SHORTAGE ON MAJOR INDUSTRIAL FUEL BURNING INSTALLATIONS. VOLUME 3. APPENDIX: SUMMARY AND ANALYSIS OF FUEL-BURNING CHARACTERISTICS OF MFBIS

J. A. Brickhill Mar. 1977 91 p refs 3 Vol.
(Contract EPA-68-02-1452)
(PB-269367/9; EPA-450/3-77-017-c-Vol-3) Avail: NTIS CSCL 10A

The impact of natural gas shortages on major fuel burning installations was analyzed. Gas curtailments plans, natural gas supplies, FEA survey data for MFBI and applicable state air pollution control regulations were reviewed. A limited analysis of all the MFBI data is presented. GRA

N78-10599# Federal Energy Administration, Washington, D. C. Office of Data and Analysis.

PROJECT INDEPENDENCE EVALUATION SYSTEM (PIES) DOCUMENTATION. VOLUME 14: A USERS GUIDE

Elizabeth Chase MacRae Jun. 1977 72 p
(PB-268850/5; FEA/W-77/115) Avail: NTIS HC A04/MF A01 CSCL 10A

The system consists of a number of complex interrelated computer models and associated data bases which can be used to project the state of the energy market in the years 1980, 1985, and 1990. By varying assumptions and data, the user can define alternative scenarios for the analysis of alternative energy issues. The purpose is to provide a potential PIES user with a description of how PIES operates with particular emphasis on the possible variations in assumptions and data that can be made in specifying alternative scenarios. GRA

N78-10600# Federal Energy Administration, Washington, D. C. Office of Regulatory Programs.

PETROLEUM SUPPLY ALTERNATIVES FOR THE NORTHERN TIER STATES THROUGH 1980

Mario Cardullo Jun. 1977 166 p
(PB-269809/0; FEA/H-77/183) Avail: NTIS HC A08/MF A01 CSCL 10A

The magnitude of the potential petroleum crude and product shortfall that will occur in the Northern Tier area as Canadian crude supplies are phased out is analyzed. The alternative(s) that will most effectively alleviate the crude and product shortfall in the near-term and facilitate implementation of the most satisfactory long-range solutions are evaluated. GRA

N78-10601# George Washington Univ., Washington, D. C. School of Engineering and Applied Science.

PERFORMANCE POTENTIAL OF THE ENERGY SEPARATOR WITHOUT MECHANICAL ENERGY RECOVERY

Joseph V. Foa Apr. 1977 25 p refs
(Grant NSF ENG-75-01409)
(PB-269721/7; TR-ES-772) Avail: NTIS HC A02/MF A01 CSCL 13A

The performance potential of the 'basic' energy separator heating or cooling system is evaluated. The best potential is found in uses involving the utilization of solar energy storage, in the simultaneous heating and cooling of separate spaces, and in vehicular air conditioning. The system is uniquely suited for application to the cooling of structures in supersonic aircraft. GRA

N78-10602# Los Alamos Scientific Lab., N. Mex.

USE OF BRACKISH GROUND WATER RESOURCES FOR REGIONAL ENERGY CENTER DEVELOPMENT, TULAROSA BASIN, NEW MEXICO: PRELIMINARY EVALUATION

Mar. 1977 503 p refs Sponsored by FEA
(PB-269898/3; FEA/G-77/101) Avail: NTIS HC A22/MF A01 CSCL 10A

The suitability of the Tularosa basin in south-central New Mexico as the site for a regional energy center is discussed, with the objective of broadening the technical and governmental dialogue about utilization of brackish aquifers, which occur in many parts of the West. Underlying the Tularosa Basin is roughly 40 million acrefeet of fresh and slightly saline water that is theoretically recoverable and could be used for cooling and other energy-related or industrial purposes. GRA

N78-10603# International Atomic Energy Agency, Vienna (Austria).

ENERGY IN DEVELOPING COUNTRIES: PROSPECTS AND PROBLEMS

V. Baum 1977 17 p refs Presented at Nucl. Power and its Fuel Cycles, Salzburg, Austria, 2 May 1977
(IAEA-CN-36/581; CONF-770505-235) Avail: NTIS (US Sales Only) HC A02/MF A01; ERDA Depository Libraries

Requirements for primary energy and electric power in the developing countries are analyzed in the light of projections of population and economic growth. The availability of indigenous energy resources and focuses on input requirements (capital, technology, trained personnel) for accelerated energy development; and possible supplies for such inputs from domestic sources, transnational corporations, multilateral institutions, and through co-operation among the developing countries themselves and between the developing and the developed countries are reviewed. ERA

N78-10604# Commissariat a l'Energie Atomique, Grenoble (France).

UNDERGROUND STORAGE OF HEAT

J. Despois and F. Nougarede 1976 14 p In FRENCH; ENGLISH summary Presented at Annual Meeting of the French Soc. of Heat Eng., Thermal Aspects of Actual Energy Problems, Grenoble, France, 24 May 1976
(CEA-Conf-3638; CONF-7605137-1) Avail: NTIS (US Sales Only) HC A02/MF A01; ERDA Depository Libraries

A mathematical model intended for solving the conservation equations in the case of heat storage inside a confined water layer is discussed. An approach of the operating conditions of storage may involve either a line-up arrangement (with the hot drilling at the center, the cold drillings being aligned on both sides) or a radial arrangement (with cold drillings at the peripheral edge encircling the hot drilling at the center of the layer). The three principal problems encountered are: starting drilling, and the circuit insulation and control. ERA

N78-10605# Central Electricity Generating Board, London (England).

UK EXPERIENCE OF PLANNING THE NUCLEAR CONTRIBUTION TO THE UK POWER PROGRAMME

S. Catchpole and F. P. Jenkin 1977 9 p refs Presented at

Intern. Conf. on Nucl. Power and its Fuel Cycles, Salzburg, Austria, 2 May 1977
(IAEA-CN-36/53; CONF-770505-243) Avail: NTIS (US Sales Only) HC A02/MF A01

The U.K. experience in planning nuclear program is outlined. The factors which have determined the size of such programs are examined together with those factors which have influenced their implementation. The role which the utility has played in the deployment of nuclear power in the U.K. is also discussed. At present, nuclear energy can only be utilized on a large scale via the electricity route, and the forecasting of electricity demand is therefore a key element in determining the size of the nuclear program. Other important issues which affect the nuclear contribution are: national fuel policies, discontinuities in price and availability of imported fossil fuels, plant capital costs, fuel price relativities, plant siting, rate of introduction of new nuclear systems, manufacturer's capability, public attitudes towards nuclear power and financing. The issues are dealt with in detail including their relative importance in the U.K. ERA

N78-10158*# European Space Technology Center, Noordwijk (Netherlands).
INVESTIGATION OF A CTS SOLAR CELL TEST PATCH UNDER SIMULATED GEOMAGNETIC SUBSTORM CHARGING CONDITIONS
K. P. Bogus *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 487-501 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 10A

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N78-10606 City Univ. of New York.
NEAR FIELD POLLUTION DUE TO EMISSIONS FROM SHORT STACKS ON BUILDINGS Ph.D. Thesis
Benjamin Jandowski 1977 148 p
Avail: Univ. Microfilms Order No. 77-13671

Near field pollution behind a building due to short stack emissions was investigated in a low speed wind tunnel expressly built to simulate urban air pollution problems. Theoretical and experimental work are reviewed and the relevant wind tunnel modeling criteria are developed and explained as they pertain to near field pollution simulation. The low speed wind tunnel and its instrumentation are described fully as well as all important operating procedures used in running the experiments of this study. A hydrocarbon tracer and monitoring technique for use in open circuit wind tunnels is discussed and a description of a real time probe traversing and data handling procedure is also included. Dissert. Abstr.

N78-10607# Weapons Research Establishment, Adelaide (Australia).
UPPER ATMOSPHERE RESEARCH BIBLIOGRAPHY OF CONTAMINANT RELEASE EXPERIMENTS, PART 3
C. H. Low and K. H. Lloyd Mar. 1977 26 p
(WRE-TM-1788(W)-Pt-3; AR-000-524-Pt-3) Avail: NTIS HC A03/MF A01

The publications involving the experimental technique of releasing vapour clouds into the upper atmosphere are listed. All aspects of the techniques are included, as are all applications to the determination of neutral atmosphere and ionospheric parameters. Author

N78-10608# Coast Guard Research and Development Center, Groton, Conn.
FIELD INFRARED METHOD TO DISCRIMINATE NATURAL SEEPS FROM NON-SEEPS, SANTA BARBARA, CALIFORNIA AREA Final Report
DeLyle Eastwood and Douglas F. Grant Dec. 1976 25 p
(AD-A042861; CGR/DC-15/76; USCG-D-32-77) Avail: NTIS HC A02/MF A01 CSCL 20/6

A field infrared method has been developed to distinguish oil due to natural seepage in the Santa Barbara (California) Channel region from closely similar oils derived from spills at offshore drilling platforms or from shipping accidents. Differences between seep and non-seep oils have been found to persist in weathering studies carried out in outdoor tanks for one week. This method involving simple infrared instrumentation and a minimum of sample preparation. It permits rapid on-site analysis without special training. The major differences between seep and non-seep oils appear in the comparison between the 13.8 micrometers and 13.5 micrometers peaks (for both weathered and unweathered oils) and in the carbonyl region at 5.85 micrometers (for unweathered oils only). GRA

N78-10609# Army Aeromedical Research Lab., Fort Rucker, Ala.
SUBJECTIVE RATINGS OF ANNOYANCE PRODUCED BY ROTARY-WING AIRCRAFT NOISE
James H. Patterson, Jr., Ben T. Mozo, Robert D. Schomer, and Robert T. Camp, Jr. May 1977 39 p refs
(AD-A043435; USAARL-77-12) Avail: NTIS HC A03/MF A01 CSCL 20/1

Subjective ratings of annoyance caused by helicopter noise relative to that caused by fixed-wing aircraft were obtained. Comparison of the subjective ratings with various physical predictors of annoyance indicated that the integrated A-weighted level (dBA) predicted as well as any of the predictors with the D2-weighted level and EPNL almost equivalent. The B-weighted level and C-weighted level did not predict as well. No correction factor for the impulsive character (blade slap) of the helicopter noise was required. No substantial penalty for helicopters compared to fixed-wing aircraft noise was required.
Author (GRA)

N78-10610# Research Triangle Inst., Research Triangle Park, N. C.
OXIDANT-PRECURSOR RELATIONSHIPS DURING POLLUTANT TRANSPORT CONDITIONS, AN OUTDOOR SMOG CHAMBER STUDY Final Report, May 1974 - Nov. 1975
L. A. Ripperton, J. E. Sickles, II, and W. C. Eaton Nov. 1976 223 p refs
(Contract EPA-68-02-1296)
(PB-269877/7; EPA-600/3-76-107) Avail: NTIS HC A10/MF A01 CSCL 07E

The formation of ozone under simulated conditions of pollutant transport was studied in a group of four 27-cubic-meter outdoor smog chambers. The initial charges in the smog chambers were irradiated for three days by natural sunlight. Simulation of transport was accomplished by progressively diluting the contents of the chambers with clean air. The initial charge of nonmethane hydrocarbon (NMHC) ranged from 1.0 to 10.0 ppmC; nitrogen oxides (NOx) ranged from 0.100 to 1.000 ppm. Therefore, initial rates of NMHC/NOx varied from 7 to 20. On the second and third days in the chambers, concentrations of NOx ranged from 0.001 to 0.053 ppm; NMHC ranged from 0.33 to 3.78 ppmC. The resulting NMHC/NOx ratios varied from 16 to 610. GRA

N78-10611# Tennessee Valley Authority, Chattanooga. Power Research Staff.
TVA'S 1-MW PILOT PLANT: FINAL REPORT ON HIGH-VELOCITY SCRUBBING AND VERTICAL DUCT MIST ELIMINATION Technical Report, Jan. - Sep. 1976
G. A. Holliden, R. F. Robards, N. D. Moore, T. M. Kelso, and R. M. Cole Mar. 1977 58 p
(PB-269850/4; PRS-19; EPA-600/7-77-019) Avail: NTIS HC A04/MF A01 CSCL 07A

The systematic test program for washing techniques that maintain continuous mist eliminator performance in lime/limestone closed-loop scrubbing systems was examined. High-velocity scrubbing tests performed in conjunction with the mist eliminator tests are also described. Continuous operation of the chevron mist eliminator, in the limestone system was maintained by washing the bottom of the mist eliminator intermittently with all the available clarified liquor, immediately followed by an allocated amount of makeup water. The top of the mist eliminator was washed intermittently with the remaining allocation of allowable makeup water. GRA

N78-10612# Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.

TRACE ANALYSIS OF ARSENIC BY COLORIMETRY, ATOMIC ABSORPTION, AND POLAROGRAPHY Technical Report, Fiscal Year 1976
Lyman H. Howe Apr. 1977 45 p refs
(PB-269652/4; TVA-E-EP-77-3; EPA-600/7-77-036) Avail: NTIS HC A03/MF A01 CSCL 07B

A differential pulse polarographic method was developed for determining total arsenic concentrations in water samples from ash ponds at steam-electric generating plants. After digestion of the sample and isolation of arsenic by solvent extraction, the peak current for arsenic is measured and compared to a standard curve. The effective range of concentrations for this method is from 2 to 50 ug/l of arsenic. The precision and accuracy of this polarographic method for determining concentrations of arsenic in water samples were compared to two standard methods, atomic absorption and colorimetery, for observations on replicate analyses of pure standard solutions, split samples from ash ponds, standard reference samples, and standard solutions spiked with potentially interfering elements. The three methods compared favorably for the split samples; however, results of the colormetric method for the replicate analyses were slightly negatively biased. GRA

N78-10613# Battelle Pacific Northwest Labs., Richland, Wash.
APPROACH TO VALUING VISUAL POLLUTION FROM WESTERN ELECTRICITY PRODUCTION
L. E. Erickson Feb. 1977 76 p refs
(Contract EY-76-C-06-1830)
(BNWL-2103) Avail: NTIS HC A05/MF A01

Approaches used to value externalities are briefly described. The approach used relies heavily on an earlier application of bidding games to estimate people's willingness to pay for abatement of emissions from the Four Corners fossil-fuel power plant in northwestern New Mexico. The results of these surveys were used here to estimate the value of visual pollution from electric power plants for residents of an visitors to the Four Corners Air Quality Control Region, as a function of power plant emissions in that region. Preliminary results of this procedure for all of the air quality control regions in the Western Systems Coordinating Council area are presented. Visual pollution damages from electric power plants to residents of an recreational visitors to these western regions are estimated to total more than $100 million anually by 1985. ERA

N78-10614# Brookhaven National Lab., Upton, N. Y.
INTEGRATED ENVIRONMENTAL ANALYSIS AND THE DEVELOPMENT OF NEW ENERGY TECHNOLOGIES
P. F. Palmedo 25 Feb. 1977 21 p refs
(Contract EY-76-C-02-0016)
(BNL-22676) Avail: NTIS HC A02/MF A01

The environmental research program in ERDA is discussed. Health, environmental, and social concerns are considered integrally in the development of individual technologies. These concerns are appropriately reviewed in the formulation of overall ERDA R and D policy. The development of basic information and data which also serve the needs of the government environmental regulatory role is analyzed. Environmental effects are manifested at the local scale. Energy R and D policy must respond to national needs and national policies. The introduction of environmental considerations into the formulation and implementation of energy R and D policy requires bridging the gap between local effects and concerns and national decisions. A crucial step in this process is analzying problems on a regional (multi-state) basis. ERA

N78-10615# California Univ., Berkeley. Lawrence Berkeley Lab.
REVIEW OF AIR QUALITY MODELING TECHNIQUES. VOLUME 8: HEALTH AND SAFETY IMPACTS OF NUCLEAR, GEOTHERMAL, AND FOSSIL-FUEL ELECTRIC GENERATION IN CALIFORNIA Final Report
Leonard C. Rosen Jan. 1977 47 p refs Sponsored in part by Calif. Energy Resources Conser. and Develop. Comm.
(Contract W-7405-eng-48)
(LBL-5998) Avail: NTIS HC A03/MF A01

Air transport and diffusion models which are applicable to the assessment of the environmental effects of nuclear, geothermal, and fossil-fuel electric generation are reviewed. The general classification of models and model inputs are discussed. A detailed examination of the statistical, Gaussianplume, Gaussian puff, one-box and species-conservation-of-mass models is given. Representative models are discussed with attention given to the assumptions, input data requirement, advantages, disadvantages and applicability of each. ERA

N78-10616# Oak Ridge National Lab., Tenn.
DIFFUSION-TYPE MODEL OF THE GLOBAL CARBON CYCLE FOR THE ESTIMATION OF DOSE TO THE WORLD POPULATION FROM RELEASES OF CARBON-14 TO THE ATMOSPHERE
G. G. Killough May 1977 96 p refs
(Contract W-7405-eng-26)
(ORNL-5269) Avail: NTIS HC A05/MF A01

A nonlinear dynamic model of the exchange of carbon among the atmosphere, terrestrial biosphere, and ocean is described and applied to estimating the radiation dose to the world's population from the release of carbon 14 to the atmosphere from the nuclear power industry. A computer implementation of the model is presented. The model treats the ocean as a diffusive medium with respect to vertical transport of carbon, and the nonlinear variation of CO2 partial pressure with the total inorganic carbon concentration in surface waters is taken into account in calculating the transfer rate from ocean to atmosphere. Transfers between the atmosphere and terrestrial biosphere are represented by nonlinear equations which consider CO2 fertilization and impose a constraint on the ultimate total carbon mass in the biosphere. ERA

N78-10617# Illinois Inst. of Tech., Chicago. Dept. of Chemistry.
PROCEEDINGS OF THE WORKSHOP ON PARTICLE TECHNOLOGY-RESEARCH NEEDS, OPPORTUNITIES AND PRIORITIES AND PRIORITIES HELD AT ASTM HEADQUARTERS Final Report, Aug. 1975 - Jun. 1977
Darsh T. Wasan May 1977 187 p refs Proc. held at Philadelphia, 21-22 Aug. 1975
(Grant NSF ENG-75-22522)
(PB-267837/3; NSF/ENG-75-22522) Avail: NTIS HC A09/MF A01 CSCL 07A

The present state of fine particle technology and its trends and problems were examined, and future research needs and opportunities delineated. Particle properties, particle-fluid separation, particle handling and control considerations in particle technology were considered. Each of the areas was discussed by selected speakers from industry, government and academic institutions. Copies of the texts of the plenary lectures and the prepared comments of the panel members are presented. GRA

N78-10618# Gulf Research and Development Co., Pittsburgh, Pa.
POLYNUCLEAR AROMATIC CONTENT OF HEAVY DUTY DIESEL ENGINE EXHAUST GASES
R. S. Spindt 17 Jan. 1977 50 p Sponsored in part by EPA
(PB-267774/8; CRC-APRAC-CAPE-24-72) Avail: NTIS HC A03/MF A01 CSCL 07D

Improved sampling and analysis methods for PNA in diesel exhaust were developed. Generally one engine was employed at a few fixed speeds and loads. The c-14 isotopes of BaP and BaA were used as tracers to compensate for losses in sampling and analysis. The sampling system was modified by diluting the exhaust sample with chilled air. Benzene was used as the filter extractant because pure benzene extracts fewer polar compounds. Isotopic dilution with c-14 PNA proved essential in compensating for the PNA sampling and analysis losses. GRA

N78-10619# Battelle Columbus Labs., Ohio.
THE FATE OF NITROGEN OXIDES IN THE ATMOSPHERE
Chester W. Spicer, James L. Gemma, Philip M. Schumacher, and Gerald F. Ward Aug. 1976 122 p refs Sponsored by EPA, Research Triangle Park, N.C.
(PB-267784/7; CRC-APRAC-CAPA-9-71; Rept-2) Avail: NTIS HC A06/MF A01 CSCL 07D

The second year of a continuing study to determine the distribution and fate of nitrogen oxides in the atmosphere is described. Analytical methods developed in the first year were refined and validated and results from the first year study were

reexamined with the aid of additional data collected simultaneously by other research groups. An instrumental technique for nitric acid was refined, tested for interference, and verified against a long-path infra-red technique under simulated smog conditions. The interference by PAN and nitric acid with the chemiluminescent determination of NO2 was studied with a view toward reducing or minimizing the interference. Nitric acid interference was eliminated by the use of a nylon prefilter on the chemiluminescent instrument. The interaction of gaseous nitric acid with alkaline glass-fiber filters was shown to yield artifact particulate nitrate. GRA

N78-10620# Texas A&M Univ., College Station. Water Resources Inst.

SIMULATION OF POLLUTANT MOVEMENT IN GROUNDWATER AQUIFERS Project Completion Report, 1 Jul. 1974 - 30 Sep. 1976

Raziuddin Khaleel and Donald L. Reddell May 1977 261 p refs

(Contracts DI-14-31-0001-5044; DI-14-31-0001-6045; OWRT Proj. A-030-TEX(1))

(PB-268835/6; W77-08807; TR-81) Avail: NTIS HC A12/MF A01 CSCL 13B

A three-dimensional model describing the two-phase (air-water) fluid flow equations in an integrated saturated-unsaturated porous medium was derived. Also, a three-dimensional convective-dispersion equation describing the movement of a conservative non-interacting tracer in a nonhomogeneous, anisotropic porous medium was developed. Finite difference forms of these two equations were solved using an implicit scheme to solve for water or air pressures, an explicit scheme to solve for water and air saturations, and the method of characteristics with a numerical tensor transformation to solve the convective-dispersion equations. The inclusion of air as a second fluid phase caused the infiltration rate to decrease rapidly to a value well below the saturated hydraulic conductivity when the air became compressed. A typical two-dimensional drainage problem in agriculture was solved in a non-homogeneous, integrated saturated-unsaturated medium using the total simulator of fluid flow and convective-dispersion equations. GRA

N78-10621# California Univ., Riverside. Statewide Air Pollution Research Center.

FORMATION OF PHOTOCHEMICAL AEROSOLS Final Report

Edgar R. Stephens and Monty A. Price May 1977 78 p refs (Grant EPA-R-80068)

(PB-268895/0; EPA-600/3-77-044) Avail: NTIS HC A05/MF A01 CSCL 07E

Counting of particles by light scattering was the principle physical technique while infrared analyses were the major source of chemical information. A new reflectance spectroscopy technique was also developed. Infrared spectra of ambient aerosols have bands assigned to sulfate, nitrate, ammonium, and water which are completely removed by water washing of the sample but not by benzene. Synthetic aerosols generated by mixing ammonia with sulfuric and nitric acids produce similar spectra. Many ambient aerosol particles are hygroscopic or deliquescent so that they swell as the relative humidity increases and shrink as it decreases. It is concluded that direct control of aerosol emissions will not markedly improve visibility in Southern California. GRA

N78-10622# Dayton Univ., Ohio. Research Inst.

AUTOMOBILE EXHAUST EMISSION SURVEILLANCE ANALYSIS OF THE FY 1974 PROGRAM

Alan P. Aerens and Michael Hill Sep. 1976 133 p refs (Contract EPA-68-03-2384)

(PB-268782/0; EPA-460/3-76-019) Avail: NTIS HC A07/MF A01 CSCL 13B

Results of the FY 74 Emission Factor Program are summarized and compared with results of the FY 71, FY 72, and FY 73, Emissions Factor Programs. The Emission Factor Program provides a realistic assessment of the effectiveness of federal regulations by testing production vehicles in the hands of the monitoring public. The FY 74 program tested a sample of 1965 to 1975 model year vehicles in seven cities. GRA

N78-10623# Environmental Research and Technology, Inc., Concord, Mass.

ANALYSIS OF PHOTOCHEMICAL OXIDANT AND PARTICULATE POLLUTION PATTERNS IN NEW ENGLAND USING REMOTE SENSING DATA Final Report

Clinton J. Bowley, Joseph L. Horowitz, and James C. Barnes Jun. 1977 52 p refs

(Contract EPA-68-02-2533)

(PB-268996/6; ERT-P-2273; EPA-901/9-77-002) Avail: NTIS HC A04/MF A01 CSCL 13B

Imagery from earth surveillance satellites was examined to assess the potential usefulness of satellite data for monitoring air pollutant patterns and defining the associated meteorological conditions in sourthern New England. Imagery from various satellite systems were visually interpreted. Results indicate a good correlation between certain types of high pollutant load and haze and smoke, with accompanying reductions in visibility. Satellite imagery can display differences in reflectance or temperature due to some combination of haze, smoke and atmospheric pollutant load, on a regional basis. GRA

N78-10624# General Accounting Office, Washington, D. C. Community and Economic Developments Div.

NOISE POLLUTION: FEDERAL PROGRAM TO CONTROL IT HAS BEEN SLOW AND INEFFECTIVE. ENVIRONMENTAL PROTECTION AGENCY. DEPARTMENT OF TRANSPORTATION

7 Mar. 1977 69 p

(PB-268690/5; CED-77-42) Avail: NTIS HC A04/MF A01 CSCL 13B

Federal efforts to control and abate noise pollution are reviewed. Although some progress has been made in fulfilling the requirements of the Noise Control Act of 1972, implementing many of the provisions has been slow and, in some cases, ineffective. Areas needing improvements are identified. GRA

N78-10625# Environmental Protection Agency, Chicago, Ill. Central Regional Lab.

THE DETERMINATION OF ANTIMONY, ARSENIC, BERYLLIUM, CADMIUM, LEAD, SELENIUM, SILVER AND TELLURIUM IN ENVIRONMENTAL WATER SAMPLES BY FLAMELESS ATOMIC ABSORPTION Final Report

5 Jan. 1977 16 p refs

(PB-269902/3; EPA-905/4-77-002) Avail: NTIS HC A02/MF A01 CSCL 07D

Analytical procedures for measuring concentrations of certain metals in environmental samples are described. Results obtained using the flameless atomic absorption procedures are compared to data obtained using the referee method. It is concluded that the flameless atomic absorption methods are equivalent or superior to the referee procedure for these metals. GRA

N78-10626# Research Triangle Inst., Research Triangle Park, N. C.

ANALYSIS OF ORGANIC AIR POLLUTANTS BY GAS CHROMATOGRAPHY AND MASS SPECTROSCOPY Interim Report

Edo D. Pellizzari Jun. 1977 116 p refs

(Contract EPA-68-02-2262)

(PB-269654/0; EPA-600/2-77-100) Avail: NTIS HC A06/MF A01 CSCL 07C

Analytical methodology based on capillary gas chromatography/mass spectrometry/computer, was developed for the collection and analysis of urban organic pollutants. The areas of investigation included: (a) the preparation and evaluation of glass capillary columns for pollution analysis, (b) the development of methodology for quantitative analysis of ambient air pollutants, and (c) the identification and quantification of organic pollutants in ambient air from several geographical locations within the continental U. S. GRA

N78-10627# California Univ., Los Angeles. School of Engineering and Applied Science.

SYSTEMS DESIGN OF A TUBULAR REVERSE OSMOSIS PLANT Ph.D. Thesis

Vinay Goel and Joseph W. McCutchan Jan. 1977 199 p refs Sponsored by Dept. of Interior

(PB-269641/7; UCLA-ENG-7704; W77-09319; Rept-64) Avail:

NTIS HC A09/MF A01 CSCL 07A

The design of a one-inch diameter tubular nodule reverse osmosis desalination plant is presented. The total system is divided into relevant subsystems: pretreatment, reverse osmosis, energy recovery, post-treatment, and brine disposal. Dynamic programming is utilized to minimize the unit cost of desalinized water. Product recovery is used as a parameter, and six discrete values of product recovery between 50% and 95% are considered. For optimization of the reverse osmosis subsystem, a parametric programming coupled with simulation model is developed. GRA

N78-10628# Virginia Inst. of Marine Science, Gloucester Point.
APPLICATION OF NUMERICAL CLASSIFICATION IN ECOLOGICAL INVESTIGATIONS OF WATER POLLUTION Final Report
Donald F. Boesch Mar. 1977 127 p refs
(Grant EPA-R-803599)
(PB-269604/5; Scientific-77; EPA-600/3-77-033) Avail: NTIS HC A07/MF A01 CSCL 06P

Procedures of numerical classification are thoroughly reviewed, including data manipulations, computation of resemblance measures and clustering methods. Agglomerative clustering methods which distort spatial relationships and intensely cluster are often most useful with ecological data. The usefulness of numerical classification is demonstrated for objective analysis of the data sets resulting from field surveys and monitoring studies conducted for the assessment of effects of pollution. GRA

N78-10629# National Science Foundation, Washington, D. C. Research Applied to National Needs.
ENVIRONMENTAL RESEARCH DESIGN, NSF OPTIONS PROGRAM Final Report
H. J. Lagorio 1 Dec. 1976 231 p refs
(PB-269683/9; NSF/RA-760750) Avail: NTIS HC A11/MF A01 CSCL 13B

A research program was developed to provide a comprehensive framework for environmental design decision-makers, covering all significant knowledge areas, and stressing the development of information which is directly applicable to the design decision-making processes. The research activities are grouped for programmatic purposes into eight main elements which parallel the program objectives. Detailed discussion of the nature of these elements is presented. Tables are included for each element indicating the allocation of funds for activities and for various funding options. Public benefits are described. GRA

N78-10630# Calspan Corp., Buffalo, N. Y.
THERMAL REMOTE SENSING CALIBRATION TECHNIQUES Final Report
John R. Schott 15 Mar. 1977 107 p refs Sponsored by the New York State Energy Research and Development Authority
(PB-269471/9; CALSPAN-NA-6019-M-1; NYSERDA-75/22) Avail: NTIS HC A06/MF A01 CSCL 13B

A technique is described for measuring water surface temperatures from airborne platforms. A number of techniques were tested and evaluated to determine which was the most suitable and with what precision surface temperatures could be measured from the air. The approaches considered were wholly airborne requiring no ground truth. The results indicate that the state-of-the-art has been advanced to a point where wholly airborne thermal infrared remote sensing of true water surface temperatures can be accomplished with sufficient precision to permit its use as a fully accomplished with sufficient precision to permit its use as fully operational approach. GRA

N78-10631# Cameron Engineers, Inc., Denver, Colo.
EVALUATION OF BACKGROUND DATA RELATING TO NEW SOURCE PERFORMANCE STANDARDS FOR LURGI GASIFICATION Final Report, Sep. 1976 - Feb. 1977
J. E. Sinor Jun. 1977 226 p refs
(Contract EPA-68-02-2152)
(PB-269557/5; EPA-600/7-77-057) Avail: NTIS HC A11/MF A01 CSCL 13B

Two different schemes for sulfur removal were examined. The coal gasification plant was divided into 15 sections; each section is discussed in a separate chapter. Areas were identified in which projected emissions data were deemed inadequate for evaluation of environmental impact. Desirable information presently lacking in other areas is summarized. GRA

N78-10632# GCA Corp., Bedford, Mass. Technology Div.
PRELIMINARY ENVIRONMENTAL ASSESSMENT OF COAL-FIRED FLUIDIZED-BED COMBUSTION SYSTEMS Progress Report, Sep. 1975 - Jun. 1976
Paul F. Fennelly, Donald F. Durocher, Hans Klemm, and Robert R. Hall May 1977 150 p refs
(Contract EPA-68-02-1316)
(PB-269556/7; GCA-TR-75-37-G; EPA-600/7-77-054) Avail: NTIS HC A07/MF A01

Organic compounds, trace elements, inorganic compounds other than SO2 and Nox, and particulates were evaluated. Using available bench scale or pilot plant data and /or simple thermodynamics and empirical correlations with data from other combustion systems, order of magnitude estimates were made of the concentrations of various elements and compounds in the flue gas, in the solid waste, and in the water discharges. GRA

N78-10633# General Accounting Office, Washington, D. C. Community and Economic Development Div.
ENVIRONMENTAL PROTECTION ISSUES FACING THE NATION
8 Jul. 1977 66 p
(PB-269748/0; CED-77-92) Avail: NTIS HC A04/MF A01 CSCL 13B

Questions have been raised on whether the environmental goals are too close to achieve or whether the right balance has been struck between environmental objectives, energy, economic, and social goals. The major environmental issues facing the Congress and the Nation are described. GRA

N78-10634# General Accounting Office, Washington, D. C. Community and Economic Development Div.
DREDGING AMERICA'S WATERWAYS AND HARBORS: MORE INFORMATION NEEDED ON ENVIRONMENTAL AND ECONOMIC ISSUES. CORPS OF ENGINEERS, CIVIL FUNCTIONS. DEPARTMENT OF THE ARMY. ENVIRONMENTAL PROTECTION AGENCY
28 Jun. 1977 73 p
(PB-269802/5; CED-77-74) Avail: NTIS HC A04/MF A01 CSCL 13B

Topics discussed include dredging and dredged-material disposal; environmental effects and risks; applicable legislation and litigation; criteria for disposal of dredged material; effects of alternative disposal methods; and research on dredging and dredged-material disposal. GRA

N78-10635# INTERA Environmental Consultants Ltd., Houston, Tex.
AIR POLLUTION METEOROLOGY DURING THE HOUSTON URBAN PLUME STUDY, JULY 1974 Final Report, 1 Jul. 1974 - 1 Jul. 1975
Gale F. Hoffnagle Jul. 1977 66 p Sponsored by EPA
(PB-269592/2; EPA-600/3-77-073) Avail: NTIS HC A04/MF A01 CSCL 13B

Meteorological parameters were measured in Houston, Texas. The data collected are primarily surface anemometer data and pilot-balloon soundings to 1830 meters above ground. These measured data, along with plots from the National Weather Service, were used to provide an overall meteorological analysis of conditions during the sampling program. Emphasis was given to the ambient environment aloft. GRA

N78-10636# Pacific Environmental Services, Inc., Santa Monica, Calif.
ECONOMIC ANALYSIS OF VAPOR RECOVERY SYSTEMS ON SMALL BULK PLANTS Final Report
R. J. Bryan, W. Jacobson, A. Kokin, R. Sakaida, and M. M. Yamada Sep. 1976 105 p refs
(Contract EPA-68-01-3156)
(PB-269884/3; EPA-340/1-77-013) Avail: NTIS HC A06/MF A01 CSCL 13B

Economic data and analysis to aid in assessing the feasibility and reasonable applicability of vapor recovery systems (particularly bottom-loading) on bulk plants are presented. GRA

N78-10637# Rockwell International Corp., Creve Couer, Mo. Air Monitoring Center.
REGIONAL AIR POLLUTION STUDY. POINT SOURCE EMISSION INVENTORY Final Report
Fred E. Littman and Robert W. Griscom Mar. 1977 354 p (Contract EPA-68-02-1081)
(PB-269567/4; EPA-600/4-77-014) Avail: NTIS HC A16/MF A01 CSCL 13B

Emission data from stationary point sources in the St. Louis Interstate Air Quality Control Region were gathered during 1975. Emissions from large sources were based on hourly, measured values at pertinent operating parameters. Those from smaller sources, between 10 and 1000 tons per year, were based on annual data modified by a detailed operating pattern. Examples of the data are presented. An emission factor verification program was initiated by testing typical sources using standard EPA methods. Results indicate good agreement for SO2 values. Data for NOx and particulates originating from combustion sources indicate that the existing factors are too high by variable but substantial amounts. GRA

N78-10013# Advisory Group for Aerospace Research and Development, Paris (France).
BETTER MARKS ON POLLUTION FOR THE SST
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 75-78 Repr. from J. Aircraft, v. 12, no. 12, Dec. 1975 p 919-929 (For availability see N78-10005 01-01)
Avail: NTIS HC A02/MF A01

N78-10015*# Advisory Group for Aerospace Research and Development, Paris (France).
THE PROBLEM OF POLLUTION FOR THE SST
Antonio Ferri *In its* Selected Papers on Advanced Design of Air Vehicles Aug. 1977 p 89-96 refs Presented at the 9th Congr. of the Intern. Council of the Aeron. Sci., Haifa, Israel 25-30 Aug. 1974 (For availability see N78-10005 01-01)
(Grant NGR-33-016-131)
(ICAS-Paper-74-29) Avail: NTIS HC A07/MF A01 CSCL 21E

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N78-10638 Illinois Univ., Urbana-Champaign.
ITERATIVE GLOBAL FLOW TECHNIQUES FOR DETECTING PROGRAM ANOMALIES Ph.D. Thesis
Will Dean Gillett 1977 200 p
Avail: Univ. Microfilms Order No. 77-14953

The anomalies to be detected are associated with program constructs that are legal (compile time constructs) within the source language, but violate basic programming concepts. These anomalies do not necessarily constitute errors, but are often associated with logic or execution errors of various forms. A set of anomalies, which are language independent and representative of the type of anomaly commonly found in students' programs, are identified. Three specific global flow frameworks, which are based on the improved iterative global flow technique, are developed and used as tools in the detection of the anomalies. Detection schemes are developed that are able to find specific instances of the anomalies without any knowledge of the algorithm the student is attempting to implement. These specific frameworks are also applicable to a wide range of global flow problems. Dissert. Abstr.

N78-10639 Illinois Univ., Urbana-Champaign.
MIDLATITUDE SPORADIC-E LAYERS Ph.D. Thesis
Kent Louis Miller 1977 261 p
Avail: Univ. Microfilms Order No. 77-14987

The partially transparent echo from midlatitude sporadic-E layers as recorded by ionosondes was investigated. One interpretation that the echo is a partial reflection at steep gradients of electron density was examined. This theory was developed, evaluated, and found not sufficient to explain the phenomenon. An alternative explanation that the midlatitude sporadic-E layers are not uniform in the horizontal plane but contain localized regions of high electron density was investigated using data obtained by incoherent-scatter radar and found to provide a satisfactory explanation. Dissert. Abstr.

N78-10640 Maine Univ., Orono.
A STUDY OF THE HEAT FLUX REVERSAL REGION UPSTREAM FROM THE EARTH'S BOW SHOCK, USING DATA FROM THE OGO 5 ELECTRON SPECTROMETER Ph.D. Thesis
Donald Joseph Hei, Jr. 1976 210 p
Avail: Univ. Microfilms Order No. 77-13733

Interplanetary data from the electron spectrometer experiment aboard the OGO 5 spacecraft were analyzed to understand the cause of non-monotonic spectral features at suprathermal energies. It was found that the source for these features has one terminus at the bow shock surface skirted by the interplanetary magnetic field and was located at the boundary between connecting and missing field geometries. The source region for non-monotonic spectral features was termed the heat flux reversal region (HFR). Plasma determined to be in the HFR was shown to have reduced magnetic field magnitude compared to data taken adjacent to the HFR. This plasma was also shown to have perpendicular electron pressure within the average range expected for the solar wind, even though plasma adjacent to the HFR differed considerably from this average range. Dissert. Abstr.

N78-10641 Illinois Univ., Urbana-Champaign.
SMALL-SCALE FLUCTUATIONS IN D-REGION IONIZATION DUE TO HYDRODYNAMIC TURBULENCE Ph.D. Thesis
Reginald James Hill 1977 405 p
Avail: Univ. Microfilms Order No. 77-14961

Consideration is given to the dynamics of the plasma, the statistical theory of turbulent advection, the relaxation to photochemical equilibrium, and the theoretical prediction of observed scattered power from electron-concentration fluctuations. The electron-neutral and ion-neutral collision frequencies for use in the continuum momentum equation are determined for low-frequency phenomena in the lower ionosphere. It is found that the assumption of a displaced Maxwellian distribution function is not a good approximation for determining such electron-neutral momentum transfer collision frequencies. Those collision frequencies which yield transport coefficients in agreement with kinetic theory are determined. An equation is derived for the drift, distortion and diffusion relative to the neutral gas of ionization inhomogeneities in the presence of both uniform and turbulent motion of the neutral gas with uniform magnetic and gravitational fields. Dissert. Abstr.

N78-10642 Polish Academy of Sciences, Warsaw.
THE ULTRASONIC DETERMINATION OF COMPRESSIVE STRENGTH OF ROCKS
Tadeusz Chrzan 13 Jan. 1977 21 p refs In POLISH; ENGLISH summary
Avail: Issuing Activity

The relationship between compressive strength and critical deformation of sandstones and basalts was investigated. The results show good correlation between the two properties, therefore, knowing the magnitude of critical deformation, the volume of the rocks, and the velocity of longitudinal and transverse waves the compressive strength of a rock can be determined by ultrasonic techniques. I.M.

N78-10643*# Transemantics, Inc., Washington, D.C.
THE ZHAMANSHIN METEORITE CRATER (THE NORTHERN NEAR-ARAL, USSR), AND ITS TEKTITES AND IMPACTITES
P. V. Florenskiy NASA Nov. 1977 47 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Geol. (USSR), no. 10, 1975 p 73-86
(Contract NASw-2792)
(NASA-TT-F-16765) Avail: NTIS HC A03/MF A01 CSCL 08G

The origin of the circular structure of Zhamanshin and related formations is hypothesized. Topograhic maps, charts and

photographs of the area are included along with a geologic description which covers stratification and specific rock formation. Tables explain the chemical composition of the area's rocks and minerals with particular emphasis placed on Zhamanshinites, irghizites, and tektites. B.L.P.

N78-10644# Weapons Research Establishment, Salisbury (Australia).
INVESTIGATIONS OF SMALL SCALE STRUCTURE OF IONIZATION IN THE D REGION USING A LANGMUIR PROBE
K. H. Lloyd, G. G. OConnor, and C. J. Beach May 1977 14 p refs
(WRE-TR-1816(W); AR-000-562) Avail: NTIS HC A02/MF A01

Partial reflection of 2 MHz radio signals, used as a technique to measure winds in the ionosphere, have shown preferential heights of enhanced reflection. A knowledge of the electron density is used in determining the reason for these preferred heights. This paper presents electron density profiles, measured on two rocket flights flown from Woomera using a nose tip Langmuir probe. Author

N78-10645*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GRAVITY MODEL IMPROVEMENT USING GEOS-3 (GEM 9 AND 10)
Francis J. Lerch, S. M. Klosko (Edgerton, Germeshausen and Grier, Inc., Riverdale, Md.), R. E. Laubscher (Computer Science Corp., Silver Spring, Md.), and C. A. Wagner Sep. 1977 134 p refs Presented at Fall Ann. Meeting of the Am. Geophysical Union, Washington, D. C., Jun. 1977 Submitted for publication
(NASA-TM-X-71414; X-921-77-246) Avail: NTIS HC A07/MF A01 CSCL 08N

The use of collocation permitted GEM 9 to be a larger field than previous derived satellite models, GEM 9 having harmonics complete to 20 x 20 with selected higher degree terms. The satellite data set has approximately 840,000 observations, of which 200,000 are laser ranges taken on 9 satellites equipped with retroreflectors. GEM 10 is complete to 22 x 22 with selected higher degree terms out to degree and order 30 amounting to a total of 592 coefficients. Comparisons with surface gravity and altimeter data indicate a substantial improvement in GEM 9 over previous satellite solutions; GEM 9 is in even closer agreement with surface data than the previously published GEM 6 solution which contained surface gravity. In particular the free air gravity anomalies calculated from GEM 9 and a surface gravity solution are in excellent agreement for the high degree terms. Author

N78-10646*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IONOSPHERIC AND MAGNETOSPHERIC PLASMAPAUSES
Joseph M. Grebowsky, John H. Hoffman (Texas Univ., Dallas), and Nelson C. Maynard Oct. 1977 34 p refs Submitted for publication
(NASA-TM-X-71416; X-621-77-257) Avail: NTIS HC A03/MF A01 CSCL 04A

During August 1972, Explorer 45 orbiting near the equatorial plane with an apogee of about 5.2 R sub e traversed magnetic field lines in close proximity to those simultaneously traversed by the topside ionospheric satellite ISIS 2 near dusk in the L range 2-5.4. The locations of the Explorer 45 plasmapause crossings during this month were compared to the latitudinal decreases of the H(+) density observed on ISIS 2 near the same magnetic field lines. The equatorially determined plasmapause field lines typically passed through or poleward of the minimum of the ionospheric light ion trough, with coincident satellite passes occurring for which the L separation between the plasmapause and trough field lines was between 1 and 2. Vertical flows of the H(+) ions in the light ion trough as detected by the magnetic ion mass spectrometer on ISIS were directed upward with velocities between 1 and 2 kilometers/sec near dusk on these passes. These velocities decreased to lower values on the low latitude side of the H(+) trough but did not show any noticeable change across the field lines corresponding to the magnetospheric plasmapause. Author

N78-10647# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
NATURE OF THE INFLUENCE OF MOISTENING OF COHESIVE SOILS WITH SALT SOLUTIONS ON SOIL COMPACTION ON THE EXAMPLE OF LOESS-LIKE LOAMS
B. F. Reltov and A. N. Yermolayeva Jul. 1977 16 p refs Transl. into ENGLISH from Izv. Vses. o Nauchn.-Issled. Inst. Gidrotekh., (Moscow), no. 106, 1974 p 287-296
(AD-A042309; CRREL-TL-640) Avail: NTIS HC A02/MF A01 CSCL 08/13

Explained is the effect of salinization of cohesive soils under mechanical loads. The compaction is shown to depend materially on the strength of the coagulation structure. The basic factors affecting the strength of the coagulation structure are as follows: the content of clay minerals and their crystal and chemical type, the composition of exchangeable ions in soils, and the hydrophylic nature of the base surfaces of clay minerals. Author (GRA)

N78-10648# Bolt, Beranek, and Newman, Inc., Cambridge, Mass. Computer Systems Div.
PHASE 1 EXPANSION OF THE SEISMIC COMMUNICATION AND CONTROL PROCESSOR SYSTEM CCP Technical Report, 30 Jun. - 31 Dec. 1976
Howard Briscoe Apr. 1977 23 p
(Contract F08606-75-C-0022; ARPA Order-2551)
(AD-A042632; BBN-3531) Avail: NTIS HC A02/MF A01 CSCL 17/2

The seismic network and the CCP are being modified to accept on-line data from LASA and four or five North American Network stations over leased lines and from NORSAR over the ARPANET. This represents a potential increase in throughput of about 50%. The CCP is being upgraded in two phases to meet the projected load increase. The effort described in this report is the first phase of the upgrading. It included increasing the private and shared memory in the CCP, designing and coding the input software for leased line North American Network stations, and a design study for buffered interface hardware for leased line data. Author (GRA)

N78-10649# Ghana Univ., Legon. Dept. of Physics.
STUDY OF THE EQUATORIAL IONOSPHERE Interim Scientific Report, 1 Jan. 1974 - 30 Sep. 1976
John R. Koster 30 Nov. 1976 26 p refs
(Grant AF-AFOSR-2628-74; AF Proj. 4643)
(AD-A042548; AFGL-TR-77-0165; ISR-3) Avail: NTIS HC A03/MF A01 CSCL 04/1

Data from five years: daily records of the amplitude and Faraday rotation angle of the 136.47 MHz beacon on ATS-3 are analyzed to give the dependence of scintillation on sunspot number. The seasonal variation is then found. Finally, correlation among scintillation index (SI), total electron content (TEC) and magnetic activity (KP) is investigated. The diurnal, seasonal and sunspot cycle dependences of the inter-correlations are investigated. Author (GRA)

N78-10650# Texas Univ., El Paso. Dept. of Electrical Engineering.
THE ATMOSPHERIC SCIENCES LABORATORY PHOTODISSOCIATION-RADIATION MODEL OF THE MIDDLE ATMOSPHERE: A USER'S MANUAL
Jerry L. Collins Jul. 1977 52 p refs
(Contract DAAD07-74-C-0263)
(AD-A043786; ECOM-77-4; Special-Rept-11) Avail: NTIS HC A04/MF A01 CSCL 04/1

A computer code to calculate time- and altitude-dependent photodissociation rates and transmitted solar flux intensities in the upper atmosphere has been developed, and is operational on the UNIVAC 1108 computer system. This document is presented to demonstrate to the interested user how to set up and execute the program. Included is a brief discussion of the files of absorption coefficients stored in FASTRAND direct access files and the various solar flux tape files which are stored in the UNIVAC 1108 System B Library. GRA

N78-10651# Systems Science and Software, La Jolla, Calif.
A REVIEW OF THE NATURE AND VARIABILITY OF THE

ANELASTIC PROPERTIES OF THE UPPER MANTLE BENEATH NORTH AMERICA AND EURASIA
Brian J. Mitchell and Thomas C. Bache Mar. 1977 33 p refs
(Contract F08606-76-C-0041; ARPA Order 2551)
(AD-A043388; SSS-R-77-3164) Avail: NTIS HC A03/MF A01 CSCL 08/7

All reasonable mechanisms for producing low-velocity zones in the upper mantle should also produce zones of low omega. The available studies of upper mantle omega and velocity for the same regions suggest that a coincidence of low velocity and low omega zones does indeed occur. Seismic body- and surface-wave data indicate a substantial low velocity, low omega zone in the upper mantle beneath western North America. The zone appears to be 150 km thick or more, the velocities for both P and S waves being lower than typical upper mantle velocities for stable regions. The available evidence for eastern North America indicates that a low velocity zone is either absent for that region or more poorly developed than it is in western North America. Most interpretations for P waves in eastern North America include no low velocity zone. Surface wave studies of the shear wave velocity structure beneath eastern North America indicate the possibility of a low velocity zone for S waves, at least in some regions. The available data for northern Europe and Asia indicate that it is a stable region with velocity and attenuative properties much like those of eastern North America. GRA

N78-10652# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
SELF-CONSISTENT PARTICLE AND PARALLEL ELECTROSTATIC FIELD DISTRIBUTIONS IN THE MAGNETOSPHERIC-IONOSPHERIC AURORAL REGION Interim Report
Yam T. Chiu and Michael Schulz 3 Aug. 1977 75 p refs
(Contract F04701-76-C-0077)
(AD-A044036; TR-0077(2960-04)-4; SAMSO-TR-77-156) Avail: NTIS HC A04/MF A01 CSCL 04/1

The variation of the self-consistent electrostatic potential along the magnetic field is calculated by application of the principle of quasi-neutrality to the plasma components distributed along an auroral field line. The equilibrium plasma consists of hot anisotropic magnetospheric plasma, ionospheric plasma evaporated or extracted upwards by the parallel electrostatic field, and back scattered electrons. It is shown that the above charged-particle populations can support a potential difference of up to several kilovolts between the equator and the ionosphere along an auroral field line. Moreover, the corresponding parallel electric field has the proper signature to account for electron precipitation characteristics. Comparisons between theoretical and observed electron precipitation fluxes lead to estimates for the various physical parameters in the model. Author (GRA)

N78-10653# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE EFFECTS OF RECENT SECULAR VARIATIONS OF THE GEOMAGNETIC FIELD ON VERTICAL CUTOFF RIGIDITY CALCULATIONS
M. A. Shea and D. F. Smart 2 Sep. 1977 8 p refs Repr. from 15th Intern. Cosmic Ray Conf., Conf. Papers, v. 4, 204, 1977 Presented at 15th Intern. Cosmic Ray Conf., 1977
(AF Proj. 2311)
(AD-A043996; AFGL-TR-77-0193) Avail: NTIS HC A02/MF A01 CSCL 04/1

Recent geomagnetic measurements have shown that changes in the geomagnetic field have deviated from the predictions of the original International Geomagnetic Reference Field (IGRF) coefficients and associated time derivatives. Accordingly, a new set of time derivatives has been determined with the suggestion that these be applied for time periods after 1975. To ascertain the effects of the changes of geomagnetic field time derivatives on cosmic ray analyses, vertical cutoff rigidities were calculated for selected locations using the IGRF 1965 field coefficients and associated time derivatives and the IGRF 1975 field coefficients and the new time derivatives making each set of calculations appropriate for a 1980 Epoch. A comparison of these two sets of calculations shows that the uncertainty in predicted magnetic fields does not appear to be a serious limiting factor in the use of calculated vertical cutoff rigidities for the analyses of cosmic radiation data. Author (GRA)

N78-10654# Lockheed Missiles and Space Co., Palo Alto, Calif.
INVESTIGATION OF IONOSPHERIC DISTURBANCES Final Report, 15 Apr. 1976 - 28 Jan. 1977
J. B. Cladis, L. L. Newkirk, M. Walt, G. T. Davidson, and W. E. Francis 28 Jan. 1977 115 p refs
(Contract DNA001-76-C-0247)
(AD-A043965; LMSC-D555985; DNA-4225F) Avail: NTIS HC A06/MF A01 CSCL 04/1

Methods are described for solving the diffusion equation for trapped particles precipitating in the ionosphere. It is shown that the variation of the particle distribution with spatial location, both latitudinal and longitudinal, must be considered, and that the bounce averaged diffusion equations are inadequate to treat the loss-cone distributions. The coupling of precipitating particles to the ionosphere is described, with applications of the AURORA doce. Mid-latitude WIDEBAND observations are described, with a discussion of interpretations based on trapped particle precipitation. Recent observations are described of loss-cone distributions of ions and electrons which do not fit the simple diffusion model. It is shown that these observations can be accounted for by the presence of kilovolt electric fields aligned with the magnetic field. It is shown that the ionosphere at large distances from a high-altitude nuclear explosion may be unstable to the Farley-Buneman mechanism, thereby providing a new mechanism for ionospheric irregularities. Author (GRA)

N78-10655# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
THE TRAPPED RADIATION HANDBOOK, CHANGE 4
John B. Cladis, Gerald T. Davidson, and Lester L. Newkirk 4 Jan. 1977 137 p refs Prepared in Cooperation with General Electric Co., Santa Barbara, Calif.
(Contract DNA001-73-C-0065; DNA001-75-C-0023)
(AD-A044304; DNA-2524H-Change-4) Avail: NTIS HC A07/MF A01 CSCL 04/1

This section presents a brief review of the trapped radiation environment in the earth's vicinity. Models of the proton and electron environments in epochs of solar maximum and solar minimum are described. Results of some updated data analysis are used to supplement the electron models. GRA

N78-10656# Army Electronics Command, Fort Monmouth, N. J.
BALLISTIC SPHERE TECHNIQUES FOR MEASURING ATMOSPHERIC PARAMETERS
Bruce W. Kennedy and James K. Luers Jul. 1977 40 p refs
(DA Proj. 1T7-65702-D-127)
(AD-A044314; ECOM-5827) Avail: NTIS HC A03/MF A01 CSCL 04/1

A near real-time method for measuring atmospheric winds, temperature, density, and pressure was initiated and tested. The technique used a 0.1-m sphere deployed from a small meteorological rocket and tracked by a high precision radar to acquire data from position measurements. Total elapsed time from launch to sphere impact was 11 to 13 minutes. Spheres were tracked by several radars, and comparable temperatures were attained between spheres. Comparisons of temperature with independent radiosondes and rocketsondes were also made and showed good agreement with two identifiable bias areas at 25 km and 35 km. Wind data showed excellent comparability with differences in direction occurring primarily in light wind conditions of less than 10 m/s. GRA

N78-10657# Columbia Univ., Palisades, N.Y. Lamont-Doherty Geological Observatory.
COMPREHENSIVE STUDY OF THE SEISMOTECTONICS OF THE ALEUTIAN ARC Annual Progress Report, 1 Mar. 1976 - 28 Feb. 1977
J. N. Davies, L. House, K. H. Jacob, K. Nakamura, O. Perez, P. Lelyveld, M. Hamburger, and L. Skinta 1977 86 p refs
(Contract EY-76-S-02-3134)
(COO-3134-10) Avail: NTIS HC A05/MF A01

Focal mechanism of the Aleutian/Alaskan earthquakes was studied. The results of 13 solutions are presented. A statistical study of Aleutian earthquakes was made to evaluate the probability of a major or great earthquake occurring within the Shumagin gap. It is concluded that an earthquake larger than magnitude

seven will occur and that the probability that it will be larger than magnitude eight is significant. ERA

N78-10658# California Univ., Berkeley. Earthquake Engineering Research Center.
SEISMOLOGICAL STUDIES OF STRONG MOTION RECORDS
Jafar Shoja-Taheri Jan. 1977 213 p refs
(Grant NSF AEN-74-21548)
(PB-269655/7; UCB/EERC-77/04) Avail: NTIS HC A10/MF A01 CSCL 08K

Problems pertinent to seismological and engineering interpretations of strong ground motions in earthquakes are studied. The main results are as follows: (1) A form of strong motion accelerogram and its associated generalized spectrum are proposed for earthquake engineering use. (2) Statistical analysis of all accelerograms of the Parkfield earthquake and the Taft earthquake indicates that the usable long period of ground displacements are limited by human reading and base-line corrections. (3) It is shown that the integration of ragged functions by regular quadrature formulas leads to significant errors. GRA

N78-10659# Massachusetts Inst. of Tech., Cambridge. Constructed Facilities Div.
A GENERAL PURPOSE ELASTO VISCO-PLASTIC CRITICAL STATE BEHAVIORAL MODEL Research Report, Sep. - Dec. 1976
William J. Roberds and Hubert H. Einstein Mar. 1977 228 p refs
(Grant NSF eng-75-19112)
(PB-269250/7; R77-8; RR-1) Avail: NTIS HC A11/MF A01 CSCL 08G

An elasto visco-plastic critical state model was developed to provide a basis for a better understanding of rock discontinuity behavior. The model is an analytical model that can be applied to any material and geometry. The relation between changes in stress state and geometry was studied in a stress-strain-time space and other aspects of material behavior modeling using non-oriented invariant related parameters. Stress and strain history dependence, including relaxation and creep as well as consolidation, can be described. The concept of the critical state makes the complete description of post yield behavior possible. GRA

N78-10660# National Geodetic Survey, Rockville, Md.
APPLICATION OF DIGITAL FILTERING TO SATELLITE GEODESY Ph.D. Thesis - Catholic Univ. of America
Clyde C. Goad May 1977 84 p refs
(PB-270192/8; NOAA-TR-NOS-71; NCS-6; NOAA-77062713)
Avail: NTIS HC A05/MF A01 CSCL 08E

The results and techniques used to estimate a nonstationary variation in the Earth's gravity field, the principal lunar semi-diurnal (M2) ocean tide, is given. Estimates of two coefficients in the harmonic expansion of the M2 global tide height were obtained. Application of the coefficients to the problem of deceleration of the lunar mean longitude yields an estimate of -27.4 arc seconds/century 2 which is in close agreement with recent analyses of ancient eclipses and modern transit data. It can be inferred that the solid tide phase lag must be less than 1 degree because the entire deceleration of the lunar mean longitude can be accounted for by the ocean tide model obtained in this study. GRA

N78-10132*# California Univ., La Jolla.
THE PLASMA ENVIRONMENT AT GEOSYNCHRONOUS ORBIT
Sherman E. DeForest *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 37-52 refs (For availability see N78-10129 01-12)
(Contract F19628-76-C-0214)
Avail: NTIS HC A99/MF A01 CSCL 22B

N78-10133*# Lockheed Missiles and Space Co., Palo Alto, Calif.
COMPOSITION OF THE HOT PLASMA NEAR GEOSYNCHRONOUS ALTITUDE
R. G. Johnson, R. D. Sharp, and E. G. Shelley *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 53-64 refs (For availability see N78-10129 01-12)
(Grant NSF DES-74-21834)
Avail: NTIS HC A99/MF A01 CSCL 04A

N78-10140*# Air Force Geophysics Lab., Hanscom AFB, Mass.
NUCLEAR BURST PLASMA INJECTION INTO THE MAGNETOSPHERE AND RESULTING SPACECRAFT CHARGING
A. L. Pavel, J. A. Cipolla (Northeastern Univ., Boston), M. B. Silevitch (Northeastern Univ., Boston), and K. I. Golden (Northeastern Univ., Boston) *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 167-174 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 04A

N78-10170*# Lockheed Missiles and Space Co., Palo Alto, Calif.
THE EFFECTS OF THE GEOSYNCHRONOUS ENERGETIC PARTICLE RADIATION ENVIRONMENT ON SPACECRAFT CHARGING PHENOMENA
J. B. Reagan, W. L. Imhof, and E. E. Gaines *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 701-713 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N78-10661 Illinois Univ., Urbana-Champaign.
WARM AND COLD ATMOSPHERIC FRONTOGENESIS Ph.D. Thesis
Louis Thomas Gidel 1977 199 p
Avail: Univ. Microfilms Order No. 77-14952

Various differences and similarities of warm and cold frontogenesis are numerically modeled. The hydrostatic, adiabatic, Boussinesq primitive equations are integrated on a two dimensional grid. The frontogenesis is forced by an along-front gradient of potential temperature and by a vertically sheared cross-front wind field. The model develops fronts with the proper vertical circulations, strengths and slopes; more positive relative vorticity is produced than negative relative vorticity and the frontal zone at the surface develops in a zone of convergence. Model results indicate that cold fronts will propagate faster than warm fronts and that the fronts will develop on the time scale of 1-3 days. Dissert. Abstr.

N78-10662 Wisconsin Univ., Madison.
A CLIMATIC CHRONOLOGY FOR AFRICA: SYNTHESIS OF GEOLOGICAL HISTORICAL, AND METEOROLOGICAL INFORMATION AND DATA Ph.D. Thesis
Sharon Elaine Nicholson 1976 345 p
Avail: Univ. Microfilms Order No. 77-8805

Long-term famine/drought chronologies were created for 22 regions in Africa, extending from South Africa throughout the Sahel and north to Algeria and Morocco. These used, along with other sorts of information, to draw a series of precipitation anomaly maps of the African continent. These include several periods of prolongued drought in the Sahel and a period of favorable conditions there in the late nineteenth century with increased precipitation along both margins of the Sahara. The method of spatial correlation was used to type precipitation anomalies in this network. The method consists of correlating the observed departure pattern for each with that of every other year, and grouping several years together (on the basis of correlation) into a frequently occurring anomaly pattern. One important finding is that the Sahel and some marginal regions of the Sahara experienced a period of increased (relative to today) precipitation in the sixteenth and seventeenth centuries. Dissert. Abstr.

N78-10663 Drexel Univ., Philadelphia, Pa.
LIDAR ACQUISITION OF ATMOSPHERIC TEMPERATURE PROFILES BY RAMAN ROTATIONAL BACKSCATTER Ph.D. Thesis
Madeline Victoria Pina 1977 146 p
Avail: Univ. Microfilms Order No. 77-13602

A dual channel laser radar system was constructed and used to acquire atmospheric temperature profiles up to 1.2 km. Use is made of the rotational Raman backscatter radiation from the nitrogen and oxygen molecules in the atmosphere. Experiments performed using such radiation demonstrate that details of temperature profiles as acquired by radiosondes can be reproduced by lidar. Refinements in the data acquisition electronics lead to profiles which agree with expected results when the data is averaged over several laser shots. Dissert. Abstr.

N78-10664 Wisconsin Univ., Madison.
COMPARISON OF LAKE BREEZE DATA WITH THE NEUMANN-MAHRER NON-HYDROSTATIC NUMERICAL MODEL Ph.D. Thesis
Alfred John Stamm 1976 154 p
Avail: Univ. Microfilms Order No. 77-8119

The Neumann-Mahrer computer model of the sea breeze was tested with data for lake breezes taken in Milwaukee. Initial and boundary conditions of the model were adjusted to approximate the conditions on these days, and the model was adapted to accept an initial synoptic wind. The resultant winds, inflow boundaries, and surface pressures produced by the model were compared with the measurements made in Milwaukee. The comparisons showed that the model responded correctly over a time scale of hours; however, wind and temperature gradients were somewhat low. When the grid spacing of the model was reduced from 5 to 1 km, the performance of the model was improved considerably. Dissert. Abstr.

N78-10665# Florida State Univ., Tallahassee. Dept. of Statistics.
RANK TESTS IN WEATHER MODIFICATION EXPERIMENTS
Morgan A. Hanson May 1977 18 p refs
(Contract N00014-76-C-0394)
(AD-A042051; FSU-Statistics-420; TR-119-ONR) Avail: NTIS HC A02/MF A01 CSCL 04/2

Rank tests are frequently used in the comparison of seeded and unseeded responses or of control and target responses in weather modification experiments. One of the more frequently used tests is the sum of squared ranks test, which under certain questionable assumptions, has been shown to have a higher asymptotic efficiency relative to the more conventional Wilcoxon test, that is the sum of (first power) ranks test. This paper investigates the pertinence to reality of the underlying assumption in the analysis of weather modification experiments by rank methods. It is shown that the squared rank test is not uniformly more efficient than the Wilcoxon test. GRA

N78-10666# L N K Corp., Inc., Silver Spring, Md.
SEVERE STORM PATTERN RECOGNITION FROM METEOROLOGICAL SATELLITE DATA. A REPORT ON CURRENT STATUS AND PROSPECTS Final Report
Laveen N. Kanal and Jo Ann Parika Jun. 1977 119 p
(Contract DAAG29-76-D-0100; DA Proj. 1T1-62111-AH-71) (AD-A042446; ECOM-77-3) Avail: NTIS MF A01 CSCL 04/2

This report presents the results of a preliminary study on severe storm feature recognition from visible and infrared meteorological satellite data. Pattern recognition models are reviewed and satellite-derived features for various categories of severe weather are enumerated and described. The detection and tracking of severe storm features are discussed in terms of cloud classification and segmentation, cloud geometry, and cloud tracking. The current status and potential feasibility of pattern recognition techniques for severe storm feature identification are assessed. Author (GRA)

N78-10667# National Center for Atmospheric Research, Boulder, Colo. Dept. of Environmental Sciences.
REVIEW OF THE NORTH DAKOTA PILOT PROGRAM
Ronald Biondini Jun. 1977 34 p refs
(Contract NSF C-760)
(PB-269588/0; NCAR-7100-77/1) Avail: NTIS HC A03/MF A01 CSCL 04B

The hail suppression component of the 1969 to 1972 North Dakota Pilot Project is reviewed. Particular attention is paid to the strengths and weaknesses of the experimental design for the project, and the analyses of seeding effects on hail presented in the final report on the project. GRA

N78-10668# Sydney Univ. (Australia). Civil Engineering Labs.
EXTREME WIND SPEEDS IN MIXED WIND CLIMATES
L. Gomes and B. J. Vickery Feb. 1977 31 p
(PB-269758/9; R-303) Avail: NTIS HC A03/MF A01 CSCL 04B

A technique is discussed which enables extreme wind speed probabilities in mixed wind climate to be determined. The technique requires a separate analysis of each significant wind producing meteorological phenomenon and practical methods of achieving this are presented. Extreme wind speed parameters obtained from each analysis are combined to yield a composite extreme wind speed diagram and several examples illustrating this procedure are shown. By means of a numerical simulation of a typical mixed wind climate, a detailed study was made of the distribution of extreme wind gusts from different meteorological phenomena. GRA

N78-10669# Illinois State Water Survey, Urbana.
LINEAR PRECIPITATION CHARACTERISTICS IN THE ATMOSPHERE Final Report, 1 Sep. 1973 - 31 Aug. 1976
Richard G. Semonin and Robert Cataneo Dec. 1976 60 p refs
(Contract F19628-74-C-0010)
(AD-A044205; AFGL-TR-76-0094) Avail: NTIS HC A04/MF A01 CSCL 04/2

This three year study was designed primarily to investigate variations in precipitation characteristics along lines. Instrumentation utilized included a dual wavelength (3 and 10 cm) radar, recording raingages, and raindrop spectrometers, all partially operated with support from other sources. Radar data recorded and analyzed were confined to azimuths in the immediate vicinity of the radial along which the raingages and spectrometers were located, and elevation angles from 0 deg -4.5 deg above ground. Radar reflectivity and attenuation were measured by the radar system, with liquid water content calculated from the attenuation information. The surface raingages were utilized to obtain rainfall rates and amounts while the raindrop spectrometers yielded dropsize spectra as well as rainfall rate data. The radar data indicated large, small-scale variations for the variables measured along the radar radials of interest for four rain periods examined. Both convective and stratiform precipitation were sampled, the convective rains having greater maxima of the variables as well as greater time and space variability for the measured parameters. Author (GRA)

N78-10670# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
BUCKLEY DEW-FORMATION STUDY Final Report, 1966 - 1975
Arnold L. Friend Jun. 1977 9 p refs
(AD-A044365; USAFETAC-84) Avail: NTIS HC A02/MF A01 CSCL 04/2

Surface weather observations at Buckley Air National Guard Base, Colorado, from 1966 to 1975 provide the basis for estimating the percentage frequency of occurrence of dew on a radome. Consideration is given to the effect of maintaining a minimum temperature of 5 C in the radome and to the moist plume of a nearby cooling-tower. Estimates are given of the percentage frequency of occurrence of dewfall by month for three hour time groups. The results show most of the dew formation to be caused by the cooling-tower plume intercepting the radome. Author (GRA)

N78-10671# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
AN EVALUATION OF SEVERAL MODELS FOR DESCRIBING THE ATMOSPHERIC WATER-VAPOR PROFILE ABOVE THE -40 C TEMPERATURE LEVEL Final Report

Laurence D. Mendenhall May 1977 19 p refs Supersedes USAFETAC-8035
(AD-A044363; USAFETAC-8035-Rev; USAFETAC-8035) Avail: NTIS HC A02/MF A01 CSCL 04/1

Conventional meteorological radiosonde humidity data are not reliable above the -40 C temperature level. An evaluation of several models used to describe the water-vapor profile above the -40 C temperature level, using frost-point data obtained from the Naval Research Laboratory (NRL), revealed that a simple model performed as well as more complex models to calculate the precipitable water. This model incorporates estimates of the frost-point temperature at the tropopause calculated with a regression equation, a hygropause fixed at 1 km above the tropopause, and an interpolated value of the mixing ratio. The error in precipitable water and in the transmissivity in the 2.95 micrometer band served as the principal means for judging the performance of the models. Author (GRA)

N78-10672# Battelle Pacific Northwest Labs., Richland, Wash.
POSTULATED WEATHER MODIFICATION EFFECTS OF LARGE ENERGY RELEASES
J. V. Ramsdell, B. C. Scott, M. M. Orgill, D. S. Renne, J. E. Hubbard, and K. A. McGinnis Feb. 1977 112 p refs
(Contract EY-76-C-06-1830)
(BNWL-2162) Avail: NTIS HC A06/MF A01

Postulated impacts of large energy releases were examined in the light of existing technical information. The magnitudes of direct atmospheric modifications were estimated, and the ecological and economic implications of the modifications were explored. Energy releases from energy centers (10 to 40 power plants at a single site) and individual power plant clusters (1 to 4 power plants) were considered. In the atmosphere the energy will exist initially as increased temperature (sensible heat), moisture (latent heat), and air motion (kinetic energy). Addition of energy could result in increased cloudiness and fog, and changed precipitation patterns. A framework for economic analysis of the impacts of the postulated atmospheric modifications was established on the basis of costs and benefits. Willingness-to-pay was selected as the appropriate measure for valuing each impact. The primary and secondary atmospheric modifications may affect recreation, transportation, and aesthetics as well as agriculture and forestry. Economic values can be placed on some of the effects. ERA

N78-10673# National Weather Service, Silver Spring, Md. Techniques Development Lab.
OPERATIONAL SYSTEM FOR PREDICTING SEVERE LOCAL STORMS TWO TO SIX HOURS IN ADVANCE
Jerome P. Charba May 1977 43 p refs
(PB-271147/1; NOAA-TM-NWS-TDL-65) Avail: NTIS HC A03/MF A01 CSCL 04B

An objective method was developed and implemented in yielding probabilities of tornadoes, large hail, and damaging surface winds 2-6 hr in advance. The probabilities are for square areas about 90 n.mi. on a slide, covering most of the U.S. east of the Rocky Mountains. The probabilities are produced by multiple linear regression equations. The independent variables or predictors in these equations are derived from routinely observed surface atmospheric variables, manually-digitized radar data, localized climatic frequencies of the predictand, and large-scale numerical model output. Subjective verification of five severe storm cases, quasi-objectively selected, showed that envelopes of the 15% and 25% probability isoplets matched up best with reported severe weather. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N78-10674# Numerical Computational Corp., Stony Brook, N. Y.
A NUMERICAL ALGORITHM FOR REMOTE SENSING OF OCEAN DENSITY PROFILES BY ACOUSTIC PULSES Final Report, 1 Jun. 1976 - 31 Jan. 1977
Yung Ming Chen and Dar Sun Tsien 1 Feb. 1977 36 p refs
(Contract N00014-76-C-0804)
(AD-A042372; NCC-1) Avail: NTIS HC A03/MF A01 CSCL 08/10

An iterative algorithm for solving nonlinear inverse problems in remote sensing of ocean density profiles by acoustic pulses is developed. The basic idea of this new algorithm is that first, the original pulse problem in the time-domain is reduced to a continuous wave problem in frequency-domain and then the nonlinear inverse problem in frequency-domain is solved by a hybrid of a Newton-like iterative method, Backus and Gilbert linear inversion technique, and the finite difference method. This new computational algorithm is tested by numerical simulations with given data from ten different frequencies and is found to give excellent results. GRA

N78-10675# Naval Supply Systems Command, Washington, D. C.
PRELIMINARY EASTERN INDIAN OCEAN GEOID FROM GEOS-3 DATA
Samuel L. Smith, III and Alan C. Chappell Jun. 1977 31 p refs
(AD-A043788; NSWC/DL-TR-3668) Avail: NTIS HC A03/MF A01 CSCL 08/5

Ninety-four passes of GEOS-3 short pulse radar altimetry data taken in July-August 1975 over the eastern Indian Ocean (by the DoD telemetry station at Perth, Australia) have been analyzed to arrive at a preliminary ocean geoid. The self consistency of the data at track intersections has a mean geoid height difference of 75 cm with a standard deviation of 2.3 meters with normal processing. Application of bias removal techniques reduced the mean geoid height difference to 9 cm and improves the self consistency of the results to a standard deviation of less than 1 m. A comparison of the GEOS-3 Geoid is made with the NASA Marsh and Chang 1976 Geoid. The GEOS-3 Geoid correlates well with the larger features of the local bottom topography. Author (GRA)

N78-10676# Delaware Univ., Newark. Coll. of Marine Studies.
SEDIMENTS, STRUCTURAL FRAMEWORK, AND EVOLUTION OF DELAWARE BAY: A TRANSGRESSIVE ESTUARINE DELTA
Charles B. Weil 1977 202 p refs
(Grants NOAA-2-35-233; NSF GH-109)
(PB-271074/7; DEL-SG-4-77) Avail: NTIS HC A10/MF A01 CSCL 08G

Grain-size analyses of 411 bottom surface sediments from Delaware Bay show a distinctive pattern of progressive sorting, with grain size decreasing in the upbay direction and toward shore. The texture pattern is produced by tidal currents and is related to bathymetry. The major sedimentary environments of the tide-dominated transgressive Delaware delta include: (1) the subaerial tidal marshes and washover barrier beaches in the lower bay; (2) the fine-grained deposites of the subtidal flats; and (3) the linear sand shoals; and (4) the estuary mouth shoal complex with mutually evasive tidal channels and flood tidal delta. The Delaware Estuary, characterized by a low supply of coarse sediment, rising relative sea level, and intensive sediment reworking by tidal currents, is a depositional model for the transgressive estuarine delta. GRA

N78-10677# State Univ. of New York, Stony Brook. Marine Sciences Research Center.
SEA SURFACE CIRCULATION IN THE NORTHWEST APEX OF THE NEW YORK BIGHT - WITH APPENDIX: BOTTOM DRIFT OVER THE CONTINENTAL SHELF, VOLUME 1. VOLUME 2, PART 1: DIAGRAMS AND DATA FOR INTERFACE DRIFT CARDS. PART 2: DIAGRAMS AND DATA FOR SEABED DRIFTERS
C. C. Hardy, E. R. Baylor, and P. Moskowitz Oct. 1976 334 p refs
(PB-269028/7; NOAA-TM-ERL-MESA-13; NOAA-77050502) Avail: NTIS HC A15/MF A01 CSCL 08C

The movement of simulated slicks was studied under field conditions. These observations are intended to identify and measure those factors dominating sea surface drift for a variety of wind and current conditions, including local anomalies. Based upon these field observations, the study permits preliminary

assessment of: the relative risk of coherent slicks converging onto the shore resulting from the operation of working oil fields on the outer continental shelf, from oil tanker and pipeline commerce and ocean dumping; and the meteorological and oceanographic conditions which effect whether, where and when slicks will strand on Long Island. GRA

N78-10678# Environmental Research Inst. of Michigan, Ann Arbor. Radar and Optics Div.
ANALYSIS OF SYNTHETIC APERTURE RADAR OCEAN WAVE DATA COLLECTED AT MARINELAND AND GEORGES BANK Final Report
Robert A. Shuchman, Robert F. Rawson, and Eric S. Kasischke Apr. 1977 171 p refs
(Grant NOAA-04-6-158-44078)
(PB-268675/6; Rept-123000-11-F; NOAA-77052503) Avail: NTIS HC A08/MF A01 CSCL 08C

Processing and analysis of data collected by the ERIM X-L imaging radar was carried out to extract useful information about ocean waves. A focusing algorithm was developed and backscatter measurements were made using an optical processor. A number of conclusions were made, including: (1) the 180 degrees wave-direction ambiguity can be resolved by a study of defocusing in the processor; (2) the modulation depth is greater for X-band than for L-band and greater for range-direction waves than for azimuth-direction waves; and (3) X-band (HH), L-band (HH), and L-band (HV) produce significant backscatter. GRA

N78-10679# Clemson Univ., S.C. Dept. of Civil Engineering.
METHODOLOGY FOR APPLYING THE FINITE ELEMENT METHOD TO PARTIALLY STRATIFIED ESTUARIES Completion Report, 1 Jul. 1974 - 30 Jun. 1975
James Earle McCoy and Billy L. Edge Jan. 1977 53 p refs Sponsored by Dept. of Interior
(OWRT Proj. S-052-SC)
(PB-267719/3; WRRI-66; W77-08198) Avail: NTIS HC A04/MF A01 CSCL 08C

A two-dimensional model which predicts constituent transport in stratified estuarine flow systems was considered. Such a model would enable planners and engineers to determine consequences of proposed modifications to stratified bodies of water. An attempt was made to ascertain whether the finite element method can be formulated for a stratified system. A nonlinear numerical analysis based on the finite element approach for an estuarine system was determined. GRA

N78-10680# National Academy of Sciences - National Research Council, Washington, D. C. Ocean Sciences Board.
MULTICHANNEL SEISMIC REFLECTION SYSTEM
Oct. 1976 39 p ref Workshop held at Columbia Univ., New York, 25-26 Nov. 1974
(PB-268906/5; NSF/IDOE-77-108) Avail: NTIS HC A03/MF A01 CSCL 08J

A workshop was organized to evaluate the needs of the U.S. academic community for multichannel seismic reflection systems. The participants formed two groups during the morning of the second day; one to identify the scientific problems for which multichannel systems are needed, and another to review available systems, their costs, capabilities, and limitations. Applications discussed included geodynamics, sedimentation, tectonics, deep ocean basins and ridges, and diagenesis. GRA

N78-10681# Washington Univ., Seattle. Dept. of Oceanography.
STUDIES OF CIRCULATION AND PRIMARY PRODUCTION IN DEEP INLET ENVIRONMENTS Final Report, 1973 - 1976
Donald F. Winter Apr. 1977 110 p refs
(Grant EPA-R-801320)
(PB-269504/7; EPA-600/3-77-049) Avail: NTIS HC A06/MF A01 CSCL 08A

The results of a three-year grant from the U.S. Environmental Protection Agency to investigate various aspects of circulation dynamics and primary production in a deep inlet environment were summarized. Throughout the course of the research, special attention has been given to Puget Sound, Washington, although many of the findings are applicable to other deep inlet waters. The several tasks undertaken during the course of the project fall into three general categories: (1) Numerical modeling of gravitational convection and tidal motions in deep esturaries; (2) Hydraulic model studies of tidal circulation patterns and dye dispersal characteristics in Puget Sound; and (3) Numerical modeling of primary production in a deep inlet (in particular, the deep central basin of Puget Sound). GRA

N78-10682# National Academy of Sciences - National Research Council, Washington, D. C.
A REPORT ON SELECTED ISSUES OF THE INTERNATIONAL DECADE OF OCEAN EXPLORATION PROGRAM OF THE NATIONAL SCIENCE FOUNDATION
Aug. 1976 16 p refs Sponsored by NSF
(PB-269077/4; NSF/IDOE-77-112) Avail: NTIS HC A02/MF A01 CSCL 08J

Recommendations are given regarding research planning for the decade of the 1980's. The function of providing support for long-term multi-institutional, multi-disciplinary studies of the oceans is an essential one that should be kept intact. The National Service Foundation and the scientific community should start getting organized now for the work that is to follow when the decade ends. There should be a concerted effort to encourage greater international cooperation in ocean research, with special emphasis on fostering the growth of oceanographic competence in the developing coastal nations. There should be increased emphasis on assuring realization of the practical implications of ongoing and planned research. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N78-10683# Civil Aeromedical Inst., Oklahoma City, Okla.
A STUDY OF EFFECTS OF HYPERTHERMIA ON LARGE, SHORT-HAIRED MALE DOGS: A SIMULATED AIR TRANSPORT ENVIRONMENTAL STRESS
G. D. Hanneman, E. A. Higgins, G. T. Price, G. E. Funkhouser, P. M. Grape, and L. Snyder Mar. 1977 9 p refs
(AD-A040432/7; FAA-AM-77-8) Avail: NTIS HC A02/MF A01 CSCL 06/19

Temperature stresses on dogs shipped by air transport were studied. Since environmental temperatures can reach as high as 130.0 F during the summer months, to assess some aspects of the heat stress problem, 20 dogs were exposed to an ambient temperature of 130.0 F for 30 minutes 10 dogs at 15 percent relative humidity and 10 at 35 percent relative humidity. Transient and permanent changes were observed, however, no dogs died from exposure. All dogs exhibited increases in heart rate, rectal temperature, blood pH, hemoglobin, packed cell volume, and red blood cell count while body weight and blood carbon dioxide decreased. There were also differences between the two groups for blood pH, blood carbon dioxide, rectal temperature, and weight loss. The major histological tissue changes attributed to hyperthermia were fragmentation of the myocardium, acute cortical necrosis in the kidneys, and marked degenerative changes in the cerebellum and cerebral cortex that were considered severe and permanent. Author

N78-10684*# Pittsburgh Univ., Pa. Vestibular Function Research Lab.
FURTHER INVESTIGATION OF THE SPONTANEOUS AND EVOKED ACTIVITY OF THE PRIMARY NEURONS OF STATORECEPTORS (AND OTHER RECEPTORS) OF THE LABYRINTH OF THE BULLFROG BEFORE, DURING AND AFTER AN EXTENDED PERIOD OF WEIGHTLESSNESS, INCLUDING ALTERNATIVE INTERVALS OF ARTIFICIAL GRAVITY Final Report, 15 Dec. 1976 - 15 Oct. 1977
15 Oct. 1977 24 p ref
(Grant NsG-2197)
(NASA-CR-154507) Avail: NTIS HC A02/MF A01 CSCL 06C

Vestibular neuron activity was examined by studying nerve stimulation and evoked response. A cooling element, applied to the nerve consisted of a silver hook through which a coolant fluid flowed. Temperature changes were recorded via microtermistors on an eight channel brush recorder, together with response.

Diffusion of the cooling effect was measured, recovery time was assessed, and the nerve was then studied hystologically and ultrastructurally. Problems in frog preparation were discussed along with problems in maintaining healthy specimens and bacteria controlled aquaria. Author

N78-10685# Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
A CONTROLLED BIOASSAY SYSTEM FOR MEASURING TOXICITY OF HEAVY METALS Final Report
K. H. Mancy and H. E. Allen Apr. 1977 123 p refs
(Contract EPA-14-12-0591)
(PB-267973/6; EPA-600/3-77-037) Avail: NTIS HC A06/MF A01 CSCL 06T

Basic design criteria for fish bioassays which are capable of elucidating the dependency of toxicity on the type and concentration of various copper species were developed utilizing equilibrium chemical concepts and appropriate analytical techniques. In order to maintain a desired copper species in the bioassay medium, synthetic waters were used under well-defined physical and chemical conditions. An experimental system was developed which permitted large volumes of the bioassay waters to be maintained at the desired chemical equilibria for the duration of the experiment. GRA

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N78-10686* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MECHANICAL ENERGY STORAGE DEVICE FOR HIP DISARTICULATION 'Patent
Wilbur C. Vallotton, inventor (to NASA) Issued 4 Oct. 1977 7 p Filed 30 Jun. 1976 Supersedes N76-26871 (14 - 17, p 2241)
(NASA-Case-ARC-10916-1; US-Patent-4,051,558; US-Patent-Appl-SN-701448; US-Patent-Class-3-1.2; US-Patent-Class-3-15; US-Patent-Class-3-29) Avail: US Patent Office CSCL 06B

An artificial leg including a trunk socket, a thigh section hingedly coupled to the trunk socket, a leg section hingedly coupled to the thigh section and a foot section hingedly coupled to the leg section is outlined. A mechanical energy storage device is operatively associated with the artificial leg for storage and release of energy during the normal walking stride of the user. Energy is stored in the mechanical energy storage device during a weight-bearing phase of the walking stride when the user's weight is on the artificial leg. Energy is released during a phase of the normal walking stride, when the user's weight is removed from the artificial leg. The stored energy is released from the energy storage device to pivot the thigh section forwardly about the hinged coupling to the trunk socket.
Official Gazette of the U.S. Patent Office

N78-10687 Columbia Univ., New York.
SWEATING RESPONSE: A MEANS OF EVALUATING THE SET-POINT THEORY DURING EXERCISE Ph.D. Thesis
Hak-Shing William Tam 1977 241 p
Avail: Univ. Microfilms Order No. 77-14851

The temperature regulation system of the human body had been recognized to behave like a feedback thermostatic system. The set-point can be changed in a fixed pattern by the environmental temperature, acclimatization, fever and circadian rhythm. During muscular exercise, different patterns of set-point shift are observed. It is shown that the reference temperature with which the sweating controller regulated its response was lowered during exercise. The gain of the response to core temperature change during exercise also decreased. The relationship of present findings with the pertinent theories is discussed and a body temperature control model during exercise is proposed. Dissert. Abstr.

N78-10688 Brown Univ., Providence, R. I.
GAS TRANSPORT IN ARTIFICIAL LUNGS: LIMITATIONS AND IMPROVEMENTS Ph.D. Thesis
Kazuo Tanishita 1976 219 p
Avail: Univ. Microfilms Order No. 77-14200

The oxygen and carbon dioxide transfer resistance through membrane oxygenators is analyzed for water (non-reactive system) and blood (reactive system) to find the limitations and possibilities of further improvement of gas transfer. The various contributions to overall gas transfer performance are thoroughly analyzed starting from simple membrane oxygenators and extending to sophisticated secondary flow devices. Analysis of the gas transfer performance in simple membrane oxygenators (capillary and parallel sheet type) demonstrates the basic idea of overall gas transfer resistance. Comparisons between experiments and theoretical predictions indicate well the transport limit of oxygen transfer and membrane limit of carbon dioxide transfer with blood. Dissert. Abstr.

N78-10689 George Washington Univ., Washington, D. C.
AN INVESTIGATION OF THE RELATIONSHIP OF THE EVOKED POTENTIAL TO VARIOUS MODES OF VISUAL STIMULATION Ph.D. Thesis
Joseph Robert Silverman 1977 136 p
Avail: Univ. Microfilms Order No. 77-15362

Various modes of visual stimulation for use in measurement of visual evoked potential (VEP) were explored. Techniques emphasized were those that offer inexpensive, flexible methods of providing diversified pattern formation, as well as the capability to be expanded to handle data in different spectral regions. The properties of devices useful as stimulators were investigated and an in depth experiment with a method for employing minimally modified video equipment as a flexible stimulation technique was accomplished. Tests were run using a black and white television receiver, a strobe and an episcotister using various time durations. The resultant visual evoked potential waveforms indicated that the validity of using a video system as a stimulation source is acceptable. Dissert. Abstr.

N78-10690 Brown Univ., Providence, R. I.
MONOCULAR AND BINOCULAR BRIGHTNESS OF MONOCHROMATIC LIGHTS Ph.D. Thesis
Eleanor Ha-Lin Leung-Hollins 1976 227 p
Avail: Univ. Microfilms Order No. 77-14155

The brightness of binocularly-viewed monochromatic lights was assessed by matching a monocular comparison light to them in brightness. Test and comparison lights were presented in the form of bipartite 1 deg field presented to the fovea, superimposed on and concentric with a 7 degree 58 second white background of 1.46 log trolands. This background was always seen by both eyes. In order to equate lights of different wavelengths for retinal illuminance, spectral luminosity curves were obtained on each subject using a cascade brightness matching procedure. These results were in reasonable agreement with spectral sensitivity curves obtained on the same subjects using a threshold method, and with the C.I.E. photopic luminous efficiency function for the standard observer. Dissert. Abstr.

N78-10691 Houston Univ., Tex.
PSYCHOPHYSIOLOGICAL ASPECTS OF TIME PERCEPTION (THE MEMORY OF SPEED) Ph.D. Thesis
George A. Vroulis 1976 209 p
Avail: Univ. Microfilms Order No. 77-13651

In order to test and measure visual temporal behavior, two rotating disks were built to simulate clocks with variable angular velocities. Subjects had to memorize the angular speed of the reference disk and be able to reproduce it later on the adjustable disk. The task of reproduction had to be accomplished under the following conditions: (a) while observing both disks at the same time, (b) 5 sec., 30 sec. later, 120 sec. later, (c) 5 sec. later but with an adjustable disk half the size of the reference disk, (d) after 120 sec. of physical exercise, (e) after 120 sec. of relaxation, (f) after 120 sec. of arithmetical exercises. Results included that: (a) Subjects can memorize angular speeds of 0.88 rpm and 3.16 rpm to at least within a 13% accuracy. (b) Subjects do not rely on the internal physiological clocks. (c) Subjects tend to overstimate the angular speed after relaxation, while they tent to understimate it after physical or arithmetical exercises. Dissert. Abstr.

N78-10692*# San Jose State Univ., Calif. Dept. of Psychology.
VESTIBULAR-VISUAL INTERACTIONS IN FLIGHT SIMULATORS Annual Status Report, 1 Sep. 1976 - 31 Aug. 1977
Brant Clark Sep. 1977 34 p refs
(Grant NGL-05-046-002)
(NASA-CR-155204; ASR-10) Avail: NTIS HC A03/MF A01 CSCL 05E

The following research work is reported: (1) vestibular-visual interactions; (2) flight management and crew system interactions; (3) peripheral cue utilization in simulation technology; (4) control of signs and symptoms of motion sickness; (5) auditory cue utilization in flight simulators, and (6) vestibular function: Animal experiments. Author

N78-10693*# System Development Corp., Edwards, Calif.
ANALYSIS OF RESPONSES OF COLD PRESSOR TESTS ON PILOTS AND EXECUTIVES
Ram Swaroop Nov. 1977 31 p
(Contract NAS4-2334)
(NASA-CR-143847) Avail: NTIS HC A03/MF A01 CSCL 06E

Statistical analyses were performed to study the relationship between cold pressor test responses and certain medical attributes of a group of 81 pilots and a group of 466 executives. The important results of this study were as follows: There was a significant relationship between a subject's cold pressor test response and his profession (that is, pilot or executive). The executives' diastolic cold pressor test responses were significantly related to their medical conditions, and their families' medical conditions. Significant relationships were observed between executives' diastolic and systolic cold pressor test responses and their history of tranquilizer and cardiac drug use. Author

N78-10694# Federal Aviation Administration, Washington, D. C. Office of Aviation Medicine.
PSYCHOPHYSIOLOGICAL EFFECTS OF AGING: DEVELOPING A FUNCTIONAL AGE INDEX FOR PILOTS. 1. A SURVEY OF THE PERTINENT LITERATURE
Siegfried J. Gerathewohl Apr. 1977 27 p refs
(AD-A040322/0; FAA-AM-77-6) Avail: NTIS HC A03/MF A01 CSCL 06/16

A functional age index for pilots is evaluated. Particular emphasis is given to studies on the effect of age differences as measured by standardized tests of sensory, perceptual, mental, cognitive and neurophysiological functions and processes, and the quantitative or objective assessment of personality traits and structure. A few examples of graphs, tables, curves, and mathematically expressed relationships between these parameters and age are given. The age-related changes of these variables and their implications to possible and actual pilot performance are discussed. Author

N78-10695# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
PILOT TRACKING PERFORMANCE AS A FUNCTION OF G STRESS AND SEAT BACK ANGLE
Kenneth W. McElreath and Michael D. Clader May 1977 17 p refs
(AD-A042950; AMRL-TR-76-107) Avail: NTIS HC A02/MF A01 CSCL 17/8

The results show degraded weapon tracking at elevated G levels. Improved subject tolerance and greater kill opportunity due to seat back angle are presented at 8G and above. The data were not sufficient to allow modeling of the tracking performance as a function of seat back angle but did show a threshold effect in the 6-8G region on pilot tracking capability. Author (GRA)

N78-10696# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
A FOUNDATION FOR SYSTEMS ANTHROPOMETRY, PHASE 1 Interim Scientific Report, 1 Jun. 1976 - 30 Nov. 1976
Herbert M. Reynolds 31 Jan. 1977 133 p refs
(Contract F44620-76-C-0115)
(AD-A042890; UM-HSRI-77-7; AFOSR-77-0911TR) Avail: NTIS HC A07/MF A01 CSCL 06/14

The purpose of the present program is to conduct basic research into the properties and requirements of three-dimensional dynamic anthropometry. In essence, the research has the expressed goal of inductively describing the linkage of the whole body for predicting body motion in three-dimensional dynamic computer simulations. This effort may be divided into three subsidiary tasks dealing with (1) the identification, location, and relationship of externally and internally 'stable' landmarks; (2) the definition of whole body and segment anatomical axes systems; and (3) the quantitative description of body motion with probabilistic characteristics of each major joint center of mobility. Author (GRA)

N78-10697# Applied Science Labs., Waltham, Mass. Gulf and Western Research and Development Group.
DEVELOPMENT AND TESTING OF AN IMPLANTABLE OXYGEN SENSOR Annual Report, Jul. 1975 - Sep. 1976
S. Aisenberg and K. W. Chang Dec. 1976 141 p refs
(Contract N01-HR-3-3003-R)
(PB-269501/3; SSD-P-708-AR-3) Avail: NTIS HC A07/MF A01 CSCL 06B

A number of intravascular fuel cell oxygen sensors were built and tested. Causes of contamination of the catalytic electrodes were identified and eliminated. The sensor short circuit current was measured as a function of O2 partial pressure and was shown to be linear. Sensor response time was measured to be about 15 seconds, in agreement with theoretical values. The time constant for increases in oxygen was measured to be larger than for decreases. Flow dependence of the sensor sensitivity was measured and was found to be acceptably small. The functional form of the flow dependence data was in good agreement with a boundary layer model. GRA

N78-10698# Air Force Academy, Colo. Dept. of Life and Behavioral Sciences.
BEHAVIORAL AND PHYSIOLOGICAL CORRELATES OF VARYING NOISE ENVIRONMENTS: ANNOTATED BIBLIOGRAPHY Final Report
Lawrence F. Sharp, John F. Swiney, and Mickey R. Dansby Dec. 1976 213 p refs
(Contract EPA-IAG-D4-0537)
(PB-267565/0; EPA-600/1-76-038) Avail: NTIS HC A10/MF A01 CSCL 06S

The annotated bibliography contains 365 references related to the behavioral and physiological effects of noise. References to research articles, texts, other literature reviews and symposia are provided. The review covers the period 1968 thru 1974. Some foreign research published as early as 1966 is reported. The review is subdivided into approximately twenty relevant areas including personality differences, sleep, sonic boom, noise measurement, effects of noise on social relevant behavior, hearing loss, temporary threshold shift, physiological effects, motor skills, vigilance and perceptual processes. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N78-10699 Brown Univ., Providence, R. I.
ADAPTATION TO DELAYED AUDITORY FEEDBACK IN TEMPORAL SYNCHRONIZATION TASKS AS EVIDENCE FOR A FEEDBACK CONTROL PROCESS IN HUMAN TIMING Ph.D. Thesis
Jill M. Steinbruegge 1976 109 p
Avail: Univ. Microfilms Order No. 77-14198

Evidence is presented for the existence of a control process in human timing capable of altering compensation for an external delay in order to establish and maintain synchronization. When the delay in response feedback was experimentally varied, subjects showed adaptation to the altered delay and regulation of timed responses toward a constant reference interval. The observed functions describing the course of adaptation to delayed feedback in an interval bisection task were well fit by functions predicted

by a linear feedback control model. In an interval reproduction task, the compensation which was applied to a reproduced interval was shown to be independent of the stimulus interval to which adaption occured. When adaptation to an external delay was complete and timing performance was asymptotic, a synchronization error proportional to the feedback delay was found to persist. Dissert. Abstr.

N78-10700 Brown Univ., Providence, R. I.
STUDIES OF ORIENTATION-CONTINGENT COLOR AFTER EFFECTS Ph.D. Thesis
Keith David White 1976 132 p
Avail: Univ. Microfilms Order No. 77-14207

Orientation-contingent color afteraffects (CAEs) which are relatively longlasting changes in the appearance of certain patterns were studied. A technique for assessment which served to standardize and systematize the method of eliciting subjects' judgments of apparent coloration was utilized. The assessment technique systematized those measures by means of its more nearly objective nature. The subjects were required to judge certain chromatic lights, whose chromaticities were specified in physical units, and from which the apparent colorations could be inferred. Those units of chromaticity are an undetermined relationship to the strengths of the CAEs themselves, however, and it was the problem of devising quantitatively useful estimates from them that was emphasized. Dissert. Abstr.

N78-10701*# Computer Sciences Corp., Mountain View, Calif.
THE EFFECT OF A VISUAL/MOTION DISPLAY MISMATCH IN A SINGLE AXIS COMPENSATORY TRACKING TASK
Douglas K. Shirachi and Richard S. Shirley Washington NASA 1977 34 p refs
(Contract NAS2-7806)
(NASA-CR-2921) Avail: NTIS HC A03/MF A01 CSCL 05H

An experiment was performed to determine the effect of a performance mismatch between the visual and motion display systems on a real time piloted aircraft simulation. Pilots performed a compensatory roll tracking task with dynamics typical of medium jet transports. Between 0 and 10 rad/sec, visual and motion system responses were equivalent to either unity or a first order lag at 4.8 rad/sec. Pilot describing functions and error scores were calculated. Results show that the mismatch between visual and motion display systems has no significant effect. It is the absence of high frequency visual and/or motion cues which significantly affects pilot performance. Author

N78-10702# Stanford Univ., Calif. Information Systems Lab.
BIOCYBERNETIC FACTORS IN HUMAN PERCEPTION AND MEMORY Final Report, 1 Feb. 1976 - 30 Apr. 1977
James Anliker, Robert Floyd, Martin Morf, and Thomas Kailath Jul. 1977 133 p refs
(Contract N00014-76-C-0597; ARPA Order 3177)
(AD-A043773; ISL-BIOCYB-77) Avail: NTIS HC A07/MF A01 CSCL 06/2

This project was concerned with the development of biocybernetic concepts and methods which have potential value for enhancing visual perception of, and visual memory for, scenic materials. The essence of the biocybernetic idea is that feedback and control schemes implemented by various machines can be used to enhance or extend various aspects of human performance beyond unaided limits. To design effective closely-coupled man-machine systems it is desirable to have the perceptual and behavioral aspects of human performance formulated in terms of feedback and control principles. In this project the investigators concentrated on studying the feedback and control possibilities inherent in the coupling of visual stimuli to eye-direction and to the phase of the EEG alpha rhythm. They succeeded in developing state-of-the-art systems for real-time tracking of eye-direction and alpha-phase; these computerized tracking systems are capable of controlling visual stimuli so that their occurrence is conditional upon eye-direction and alpha-phase. Their computerized eye-tracker system, known as PERSEUS, incorporates the 2-dimensional double-Purkinje-image eye-tracker (DPIET) developed at the Stanford Research Institute. This non-contacting device tracks and compares the positions of the first and fourth Purkinje images formed by reflections of infrared light beamed at the subject's eye. By comparing the position of the fourth Purkinje image with respect to the first Purkinje image, one obtains a sensitive measure of eye-rotation which is uncontaminated by eye-translation. A computerized scheme was implemented for the phase-contingent analysis of the average visual evoked potential. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N78-10703 Wisconsin Univ., Madison.
INTERACTIVE MODELING AND ANALYSIS OF DYNAMIC SYSTEMS WITH APPLICATIONS TO THE MUSCULOSKELETAL STRUCTURE Ph.D. Thesis
Robert John Williams 1976 402 p
Avail: Univ. Microfilms Order No. 77-8125

A computer based procedure for modeling and analyzing large displacement dynamic systems of the open or closed loop types is described. The procedure facilitates the construction of the model for such systems, automatically formulates the dynamic equations and provides the solution for any given input motion. The program is capable of analyzing complex systems with redundant force actuators utilizing a linear programming optimization scheme. It incorporates an interactive graphic capability which is invaluable in the construction, modification and visual checking of the adequacy of a model. The interactive command language inputs for the musculoskeletal structure analysis is specially designed to allow users, without extensive training to utilize the system in many research areas. Dissert. Abstr.

N78-10704*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Bioengineering Organization.
DEVELOPMENT OF A NON-CRYOGENIC NITROGEN/OXYGEN SUPPLY SYSTEM
Sep. 1977 138 p refs
(Contract NAS9-13720)
(NASA-CR-151542; LMSC-D564425) Avail: NTIS HC A07/MF A01 CSCL 06K

Modular components were refined or replaced to improve the performance of the electrolysis module in a system which generates both oxygen and hydrogen from hydrazine hydrate. Significant mechanical and electrical performance improvements were achieved in the cathode. Improvements were also made in the phase separation area but at considerable cost in time and money and to the detriment of other investigative areas. Only the pump/bubble separator failed in a manner necessitating redesign. Its failure was, however, due to its being operated above the temperature range for which it was designed. The basic electrolysis cell design was not changed. Author

N78-10705# Aerospace Systems, Inc., Burlington, Mass.
GENERAL AVIATION PILOT STALL AWARENESS TRAINING STUDY Final Report, Jun. 1975 - Aug. 1976
William C. Hoffman and Walter M. Hollister Sep. 1976 265 p refs
(Contract DOT-FA75WA-3716)
(AD-A041310/4; ASI-TR-76-37; FAA-RD-77-26) Avail: NTIS HC A12/MF A01 CSCL 05/9

Focus was placed on the potential of enhanced pilot training in the areas of stall/spin recognition, avoidance, and recovery. The objectives were to determine the weakness of present flight training syllabi, the methods of training used, and the flight instruction presently provided in the stall/spin area; conceive an experimental stall/spin increment to an established flight and ground training syllabus; and conduct flight and ground test evaluations of this syllabus change and the flight instruction techniques required. Volunteer student pilots were divided into four groups, each receiving different degrees of stall/spin training. Evaluation flight tests were conducted prior to and after the training period. Results indicate that additional ground training in the subject of stalls and spins, additional flight training on stall awareness, and/or intentional spin training would all have a positive influence toward reducing inadvertent stalls and spins. Author

N78-10706# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
A MODEL FOR THE PILOT'S USE OF MOTION CUBES IN ROLL-AXIS TRACKING TASKS Interim Scientific Report
William H. Levison and Andrew M. Junker (AMRL) Wright-Patterson AFB, Ohio AMRL Jun. 1977 80 p refs
(Contract F44620-75-C-0060)
(AD-A043690; BBN-3528; AMRL-TR-77-40) Avail: NTIS HC A05/MF A01 CSCL 17/8

An experimental and analytical study was undertaken to test a model for the pilot's use of motion cues in roll-axis tracking tasks. Simulated target-following and disturbance-regulations tasks were explored with subjects using visual-only and combined visual and motion cues. The effects of motion cues on task performance and pilot response behavior were appreciably different for the two task configurations and were consistent with data reported in earlier studies for similar task configurations. The 'optimal-control' model for pilot/vehicle systems provided a task-independent framework for accounting for the pilot's use of motion cues. Results were consistent with the hypothesis of attention-sharing between visual and motion variables. GRA

N78-10707# Systems Research Labs., Inc., Dayton, Ohio.
VISUALLY EVOKED BRAIN POTENTIALS AS AIDS IN DISPLAY DESIGN
Robert D. ODonnell and Ronald J. Spicuzza Aug. 1977 11 p refs
(Contract F33615-75-C-0127)
(AD-A043853; AMRL-TR-77-58) Avail: NTIS HC A02/MF A01 CSCL 05/5

The electrical activity of the brain in response to a visual scene is being used as an adjunct to measurement techniques in several human engineering and medical applications. Recorded from electrodes placed on the subject's scalp, this 'evoked potential' sensitively measures the way that the human responds to differing presentations of the outside world. It permits evaluation of the effects of changes in the sensory qualities of a displayed scene, as well as the cognitive demands and response requirements of a specific task. As such, the evoked potential provides a unified metric that allows the engineering psychologist to assess the total requirements placed on the subject, from sensory input to motor output. Several studies are reported using this technique to answer questions of display design and operator performance. GRA

N78-10708# Michigan Univ., Ann Arbor. Highway Safety Research Inst.
WHOLE BODY RESPONSE OF THE HYBRID 3 ANTHROPOMORPHIC TEST DEVICE Final Report, 1 Jan. - 28 Feb. 1977
Nabih M. Alem, Joseph B. Benson, and John W. Melvin 28 Feb. 1977 226 p Sponsored by General Motors Research Labs.
(PB-268702/8; UM-HSRI-77-10) Avail: NTIS HC A11/MF A01 CSCL 13F

Whole body kinematic response of the GM Hybrid-III anthropomorphic test device were obtained. Controlled test conditions which represent realistic automotive impact environments were utilized. Raw data and analysis results of 9 tests conducted at 3 impact severity levels are presented. GRA

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

N78-10709* National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
MEMORY DEVICE FOR TWO-DIMENSIONAL RADIANT ENERGY ARRAY COMPUTERS Patent
David H. Schaefer and James P. Strong, III, inventors (to NASA) Issued 4 Oct. 1977 27 p Filed 13 Feb. 1976 Supersedes N76-18803 (14 - 09, p 1171) Division of US Patent Appl. SN-468614, filed 8 May, 1974, US Patent 3,996,455
(NASA-Case-GSC-11839-2; US-Patent-4,052,705; US-Patent-Appl-SN-657996; US-Patent-Class-340-173LM; US-Patent-Class-350-96R; US-Patent-Class-356-169; US-Patent-Appl-SN-468614; US-Patent-4,996,455) Avail: US Patent Office CSCL 09B

A memory device for two dimensional radiant energy array computers was developed, in which the memory device stores digital information in an input array of radiant energy digital signals that are characterized by ordered rows and columns. The memory device contains a radiant energy logic storing device having a pair of input surface locations for receiving a pair of separate radiant energy digital signal arrays and an output surface location adapted to transmit a radiant energy digital signal array. A regenerative feedback device that couples one of the input surface locations to the output surface location in a manner for causing regenerative feedback is also included
Official Gazette of the U.S. Patent Office

N78-10710 Illinois Univ., Urbana-Champaign.
DYNAMIC MEMORY ALLOCATION IN A VIRTUAL MEMORY COMPUTER Ph.D. Thesis
Robert Lucius Budzinski 1977 146 p
Avail: Univ. Microfilms Order No. 77-14931

An algorithm, DMIN, for computing an optimal dynamic allocation which minimizes the space-time cost in a demand paging virtual memory is presented. The problem is represented by a graph. After the reduction, the optimal allocation is found by determining the maximum flow in the remaining graph. The memory allocation resulting from DMIN is compared with that from MIN, an optimal static allocation algorithm. The DMIN allocation is also compared with two dynamic heuristic algorithms: the Page Fault Frequency algorithm and the Damped Working Set algorithm. Dissert. Abstr.

N78-10711*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A SERIAL DIGITAL DATA COMMUNICATIONS DEVICE
John L. Fetter Sep. 1977 26 p refs
(NASA-TM-73242; A-7041) Avail: NTIS HC A03/MF A01 CSCL 09B

A general purpose computer peripheral device which is used to provide a full-duplex, serial, digital data transmission link between a Xerox Sigma computer and a wide variety of external equipment, including computers, terminals, and special purpose devices is reported. The interface has an extensive set of user defined options to assist the user in establishing the necessary data links. This report describes those options and other features of the serial communications interface and its

performance by discussing its application to a particular problem. Author

N78-10712# Rome Air Development Center, Griffiss AFB, N.Y.
UNATTENDED TESTING SESSIONS ON THE HONEYWELL MULTICS COMPUTER
Donald M. Elefante Mar. 1977 44 p
(AD-A041824; RADC-TR-77-75) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report discusses the procedure used to run a series of machine-dedicated performance evaluation tests without any machine operator intervention, either before or after the tests, and with minimum disruption to normal time-sharing service. The procedure involves, among other things, setting up a control program to execute at some optimum time in the future, whereupon MULTICS is automatically induced to remove itself from its normal user support status, log in a predetermined set of artificial users for the duration of the test, and following this, restore itself to its normal user (timesharing) status. Author (GRA)

N78-10713# Defense Systems Management School, Fort Belvoir, Va.
SOFTWARE MANAGEMENT: APPLYING HARDWARE DISCIPLINES TO SOFTWARE MANAGEMENT Student Project Report
Lee A. Anderson Nov. 1976 36 p refs
(AD-A041887) Avail: NTIS HC A03/MF A01 CSCL 05/1

After an introduction, this study report discusses the acquisition life cycle. The report outlines how a life cycle should be used to manage the acquisition of software. Configuration management is introduced by relating the configuration management baselines to the life cycles. It further discusses the configuration management functions of configuration identification, configuration control, and configuration statius accounting. The report strongly supports the use of configuration management as a discipline in the management of software. The report next discusses the use of technical reviews and audits in the management of software. Finally the report discusses what data must be procured to support a software system. The general conclusion of the report is that hardware disciplines can and should be adapted and used in the management of software. The author used documents published by the Department of Defense and the United States Air Force as guidance in presenting the material. However, the author attempted to write the report in general terms so that Navy and Army personnel, along with Air FOrce personnel could read and understand the report. Also, the author hopes that persons familiar with the acquisition of hardware, but not software, could read this report and begin to understand software management. Author (GRA)

N78-10714# Naval Postgraduate School, Monterey, Calif.
PRIVACY LEGISLATION AND ITS IMPLICATION TOWARD THE COMPUTER INDUSTRY M.S. Thesis
Carol Jean Janssens Jun. 1977 52 p refs
(AD-A042280) Avail: NTIS HC A04/MF A01 CSCL 09/2

This thesis researched the effect major legislation in the area of individual privacy has on the computer industry. Definitions and current legislation are discussed. Specifically, the influence of privacy legislation in the following areas was considered, Management, (Data), Accuracy and Flow, Hardware, Software and Cost. Certain recommendations for implementation of legislative requirements and problems created by existing regulations are discussed. Author (GRA)

N78-10715# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
DATA PROCESSING AND ANALYSIS FOR ICECAP AND RELATED PROJECTS Final Scientific Report, 4 Dec. 1972 - 3 Dec. 1976
Dennis E. Delorey and Paul N. Pruneau 31 Jan. 1977 256 p
(Contract F19628-73-C-0133)
(AD-A042261; BC-SDAL-77-02; AFGL-TR-77-0058) Avail: NTIS HC A12/MF A01 CSCL 09/2

This report summarizes the data processing techniques and procedures used in the creation of data bases for ICECAP, EXCEDE and related projects. The data processing system and management procedures are detailed. Data bases created are summarized. Calibration information used in parameter determinations is also summarized. Author (GRA)

N78-10716# Aerodyne Research, Inc., Bedford, Mass.
MRDA: A MEDIUM RESOLUTION DATA ANALYSIS CODE FOR THE HP 2100 COMPUTER Final Report, 26 Mar. - 31 Dec. 1976
D. Kryger and D. Robertson Jan. 1977 89 p refs
(Contract F19628-76-C-0173; ARPA Order 2656; DA MIPR A31687-63-7257)
(AD-A042263; ARI-RR-97; AFGL-TR-77-0044) Avail: NTIS MF A01 CSCL 09/2

This report describes the Medium Resolution Data Analysis Code (MRDA) which is a computer software code developed to run on the HP2100 mini-computer at the Air Force Geophysics Laboratory. The code calculates the atmosphere transmittance of radiation in the 1800-6000/cm range. The code can be used for a variety of paths(horizontal, vertical, downward, to space, etc). The user has the option of using either the 1962 U.S. Standard Model atmosphere or radiosonde data. Because of size restriction on the HP2100, MRDA is dividied into seven overlays. The spectral absorption coefficients, which are calculated from the AFGL compilation of molecular line parameters (HITRAN), are accessed from a data tape. The transmittance calculated for horizontal paths near sea level agree with those calculated with HITRAN, but MRDA tends to overestimate the absorption in the neighborhood of strongly absorbing lines. Some recommendations for further upgrading of the code are given. Author (GRA)

N78-10717# Army Construction Engineering Research Lab., Champaign, Ill.
FIELD PARTICIPATION IN CAEADS Final Report
Laurence R. Sadoff Jul. 1977 28 p
(AD-A042665; CERL-Technical-Ms-ADS-4) Avail: NTIS HC A03/MF A01 CSCL 09/2

This manuscript documents the interaction of the Computer Aided Engineering and Architectural Design System (CAEADS) staff with Corps of Engineers field organizations and describes the active field participation in the CAEADS project. The forms of field/staff interaction and their results to date are discussed. The CAEADS experience described in this report demonstrates the positive benefits of soliciting and incorporating field input into research projects conducted by Corps laboratories. Author (GRA)

N78-10718# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
SITE SURVEY REPORT FOR FNWC/ACCAT CONNECTION
R. DePesa, S. Chipman, and Robert Thomas Jul. 1977 22 p
(Contract N00039-77-C-0239; ARPA Order 3178)
(AD-A042283; BBN-3612) Avail: NTIS HC A02/MF A01 CSCL 09/2

Two DEC PDP-11 systems are to be installed at the Fleet Numerical Weather Center (FNWC) to interface FNWC CDC6500 Computers to the ARPANET. One system is to be used to interface two CDC6500 computers that operate in a secure mode to the ACCAT subnet of the ARPANET. The second system is to be used to interface a third CDC6500 that operates in an unclassified mode to the non-secure ARPANET. This report details information required to prepare the FNWC facilities for the installation of the PDP-11 systems. Author (GRA)

N78-10719# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
PARALLEL EXECUTION OF A SET OF TASKS ON AN ASYNCHRONOUS MULTIPROCESSOR Interim Report
G. M. Baudet, R. P. Brent, and H. T. Kung Jun. 1977 32 p refs
(Contract N00014-76-C-0370)
(AD-A042505) Avail: NTIS HC A03/MF A01 CSCL 09/2

Given a sequence of tasks to be performed serially, a parallel algorithm is proposed to accelerate the execution of the tasks on an asynchronous multiprocessor by taking advantage of fluctuations in the execution times. A parallel program requiring no critical section is given to implement the algorithm and its correctness is proved. A spacewise more efficient implementation is also given but requires the use of critical sections. An analysis is presented for both implementations to estimate the speed-up achievable with the parallel algorithm. When the execution times

are exponentially distributed, and no critical section is used, the algorithm with k processes yields a speed-up of order sq rt of k. Author (GRA)

N78-10720# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

A PRODUCTION SYSTEM MONITOR FOR PARALLEL COMPUTERS Interim Report

Charles L. Forgy Apr. 1977 32 p refs

(Contract F44620-73-C-0074)

(AD-A042158; AFOSR-77-0795TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

Production systems cannot compete on an equal basis with conventional programming languages until the efficiency of their monitors is improved. The process that finds the true productions on every cycle is most in need of improvement; even in today's small systems this process is often expensive and it is likely to become more expensive if productions systems become larger. There are a number of possible ways to achieve the greater efficiency, including taking advantage of the slow rate of change of the data base, taking advantage of similarities in structure of the antecedent conditions of productions, expending a minimum of effort on false antecedent conditions, avoiding whenever possible the operations that are likely to be most time consuming, and making efficient use of hardware. Since computer power is achieved most economically today through parallelism, no algorithm can be truly efficient in its use of hardware unless it can be executed in parallel. A production system monitor has been implemented that responds in a reasonable manner to both the peculiar nature of the task and the realities of current hardware technology. Author (GRA)

N78-10721# Federal COBOL Compiler Testing Service, Washington, D. C.

COBOL COMPILER VALIDATION SUMMARY REPORT

1 Jul. 1977 72 p

(AD-A042165; CCVS74-VSR240) Avail: NTIS HC A04/MF A01 CSCL 09/2

This Validation Summary Report (VSR) for the Honeywell Multics COBOL Compiler Version 2.3 (Multics Version MR4.0) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the High level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed.

Author (GRA)

N78-10722# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Electrical and Computer Engineering.

MICROPROCESSOR UTILIZATION IN COMMUNICATIONS SYSTEM MONITORING

J. J. Kirby, R. A. Meyer, and S. C. Crist Jun. 1977 137 p refs

(Contract F30602-75-C-0082)

(AD-A042145; RADC-TR-77-218) Avail: NTIS HC A07/MF A01 CSCL 09/2

This report illustrates how a microprocessor may be used to monitor the operating performance of the Frankfurt-Koenigstuhl-Vaihingen (FKV) area of the European Defense Communications System (EDCS). Specifically described are the interfaces and software routines necessary to carry out the monitoring function and the advantages and limitations of the proposed microprocessor system. Background information is also given which describes various monitoring methods previously suggested for EDCS. Also described are the various communications devices which are deployed in the FKV area and a non-microprocessor-controlled monitoring system which is currently proposed for that area.

Author (GRA)

N78-10723# Rockwell International Corp., Anaheim, Calif. Electronics Research Div

HIGH DENSITY MAGNETIC BUBBLE MEMORY TECHNIQUES Interim Report, 4 May - 4 Nov. 1976

P. J. Besser, D. M. Heinz, T. Kobayashi, and T. Chen Jun. 1977 34 p refs

(Contract F33615-76-C-1198; AF Proj. 2305)

(AD-A042368; C76-845.7/501; AFAL-TR-77-17) Avail: NTIS HC A03/MF A01 CSCL 09/2

Several material compositions have been investigated with the goal of obtaining a material suitable for operation in devices requiring bubble domain diameters of approx 1 micrometer. An YSmTmGaIG composition has shown attractive material properties and has been submitted for device evaluation. Analysis of self-biased structures has been performed. The results show a dependence of the effective bias field on the quality factor q. This analysis has provided improved criteria for selection of the optimum parameters for temperature stable self-biased materials/devices. Component designs for a hybrid decoder chip and a wafer level integration approach to a high capacity chip have been completed. A test chip incorporating several versions of the components has been submitted for fabrication and evaluation. A conceptual study of a 10 to the 12th power bit data storage system has been initiated. Author (GRA)

N78-10724# Stanford Univ., Calif. Dept. of Computer Science.

EXPLANATION CAPABILITIES OF PRODUCTION-BASED CONSULTATION SYSTEMS

A. Carlisle Scott, William J. Clancey, Randall Davis, and Edward H. Shortliffe Feb. 1977 35 p refs

(Contract DAHC15-73-C-0435; ARPA Order 2494)

(AD-A042719; STAN-CS-77-593; HPP-77-1) Avail: NTIS HC A03/MF A01 CSCL 05/8

A computer program that models an expert in a given domain is more likely to be accepted by experts in that domain, and by non-experts seeking its advice, if the system can explain its actions. An explanation capability not only adds to the system's credibility, but also enables the non-expert user to learn from it. Furthermore, clear explanations allow an expert to check the system's 'reasoning', possibly discovering the need for refinements and additions to the system's knowledge base. In a developing system, an explanation capability can be used as a debugging aid to verify that additions to the system are working as they should. This paper discusses the general characteristics of explanation systems: what types of explanations they should be able to give, what types of knowledge will be needed in order to give these explanations, and how this knowledge might be organized. The explanation facility in MYCIN is discussed as an illustration of how the various problems might be approached. Author (GRA)

N78-10725# National Bureau of Standards, Washington, D. C. Inst. for Computer Sciences and Technology.

DATA COMPRESSION: A COMPARISON OF METHODS Final Report

Jules Aronson Jun. 1977 43 p refs

(PB-269296/0; NBS-SP-500-12; LCCCN-77-608132) Avail: NTIS HC A03/MF A01 CSCL 09B

Data compression methods are surveyed and related to a standard statistical coding problem -- the noiseless coding problem. The well defined solution to that problem serves as a standard on which to base the effectiveness of data compression methods. A simple measure, based on the characterization of the solution to the noiseless coding problem, is stated through which the effectiveness of a data compression method can be calculated. Guidelines are stated concerning the relevance of data compression to data processing applications. GRA

N78-10726# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.

GEOMETRY AND FUNCTION DEFINITION FOR DISCRETE ANALYSIS AND ITS RELATIONSHIP TO THE DESIGN DATA BASE

H. A. Kamel and M. W. McCabe 1 Aug. 1977 33 p refs Presented at the First Intern. Symp. on Computer-Aided Hull-Surface Definition, Annapolis, 26-27 Sep. 1977; hosted by the Soc. of Naval Architects and Marine Engrs.

(Contracts N00014-75-C-0837; DOT-CG-43565-A; NR Proj. 064-531)

(AD-A043385; TR-2) Avail: NTIS HC A03/MF A01 CSCL 09/2

The purpose of this paper is to discuss data requirements for structural analysis, in order to clarify its dependence on the design process as a whole. The model generation capabilities of a state-of-the-art structural analysis system (GIFTS 4), heavily oriented towards pre-and post-processing and computer graphics, is presented. The system is capable of generating points, curves, surfaces, and solids in a hierarchical manner. It recognizes that geometric definition is only a part, albeit a fundamental part, of the structural system definition. The geometric components are used as a reference geometry, upon which the user may define loading patterns, kinematic boundary conditions, material property variation and so on. It is in linking these items together with the geometry that a structural analysis becomes feasible. In presenting and discussing the data base requirements for a structural analysis in a consistent manner, the designer of a CAD system is presented with basic data requirements to be included in his data base design. Author (GRA)

N78-10727# Texas Univ., Austin. Center for Cybernetic Studies.

A COMMITTEE RANKING PROBLEM USING ORIGINAL UTILITIES

Ronald D. Armstrong and Wade D. Cook Jul. 1977 34 p refs

(Contract N00014-75-C-0569; Grants NRC A-8966; NSF MCS-00100)

(AD-A044408; CCS-298) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper investigates aspects of obtaining a concensus ranking from ordinal rankings supplied by committee members. A procedure for calculating the distance between rankings which are represented by vectors is given along with an algorithm for deriving a min-max concensus ranking. In addition, an approach to the committee ranking problem which makes allowances for weights, partial rankings and multiple attributes is discussed. Author (GRA)

N78-10728# California Univ., Livermore. Lawrence Livermore Lab.

COMPUTER-BASED TRANSPORTABLE DATA-ACQUISITION AND CONTROL SYSTEM

Dennis K. Fisher, M. R. Posehn, F. L. Sindelar, and H. H. Bell 30 Sep. 1976 12 p refs Presented at 47 Shock and Vibration Symp., Albuquerque, N. Mex., 19 Oct. 1976

(Contract W-7405-eng-48)

(UCRL-78339-Rev-1; Conf-761062-9) Avail: NTIS HC A02/MF A01

A computer based transportable data acquisition and control system for use in laboratory physical testing was developed through a top down design approach. The principal characteristics of the resulting system are a versatile process interface, sophisticated on line data reduction, and ease of programming. Applications included thermocouple data acquisition, holographic interferometry, impulse response testing, and vibration shaker control. ERA

N78-10729# California Univ., Livermore. Lawrence Livermore Lab.

PRACTICAL CONSIDERATIONS IN IMPLEMENTING A REAL-TIME CONTROLLER DESIGN AUTOMATION SYSTEM

R. J. Smith, II and M. N. Matelan (General Dynamics, San Diego) 2 Feb. 1977 4 p refs Presented at the ACM/IEEE Symp. on Automation and Microprocessors, Palo Alto, Calif., 24-25 Feb. 1977

(Contract W-7405-eng-48)

(UCRL-79142) Avail: NTIS HC A02/MF A01

Technqiues using automatic hardware and software synthesis to reduce the complexity of designing real-time control systems are outlined. Practical considerations in implementing a usable design automation system, employing these techniques, and producing a complete real-time controller given only a behavioral application description, are discussed. Author

N78-10730# Stanford Linear Accelerator Center, Calif.

DPAK AND HPAK: A VERSATILE DISPLAY AND HISTOGRAMMING PACKAGE

C. A. Logg, A. M. Boyarski, A. J. Cook, and R. L. A. Cottrell Jun. 1976 95 p refs

(Contract EY-76-C-03-0515)

(SLAL-196) Avail: NTIS HC A05/MF A01

The features of a display and histogram package which requires a minimal number of subroutine calls in order to generate graphic output on a variety of devices are described. Default options are preset to values that are generally most wanted, but the default values may be readily changed to the user's needs (e.g., size of plot, type of scales, scale factors, plot characters, super-imposing several plots, etc.). The set of routines (HPAK) for generating histograms provides a means of allocating memory for histograms, accumulating data into histograms, and subsequently displaying the histograms via calls to the DPAK routines. Histograms and displays of either one or two independent variables can be made. ERA

N78-10731# California Univ., Livermore. Lawrence Livermore Lab.

RESEARCH LEADING TO THE PRODUCTION AND EARLY USE OF NUMERIC DATA BANKS OF MATERIAL PROPERTIES AND SYSTEM ANALYSES Quarterly Progress Report, Jul. - Sep. 1976

T. M. Quick and E. A. Henry 21 Mar. 1977 27 p refs

(Contract W-7405-eng-48)

(UCRL-50038-76-3) Avail: NTIS HC A03/MF A01

Research leading to creation of a numerical data base of material properties is described. The following material properties data requests were sent to the National Bureau of Standards (NBS) for assignment to data evaluation centers: 16 properties of 16 fiber materials considered for composite flywheel rotors; 27 properties of 13 epoxy resin systems and 6 polyester resins considered as matrix materials for fiber composite flywheels; and 13 properties of 18 metals and metal alloys that can store hydrogen in the form of metallic hydrides. A prototype structure for the material properties data bases was completed and used to organize data on the properties of salts used in thermal storage systems. The bibliographic data base for flywheel energy storage, containing 385 citations from the world literature, is being readied for publication. Some funds were recieved for a computerized communications network which will eventually enable ERDA/STOR scientist throughout the country to exchange information within their research specialties. ERA

N78-10732# Du Pont de Nemours (E. I.) and Co., Aiken, S. C.

ON-LINE COMPUTER SYSTEM FOR WORK-ORDER CONTROL

R. A. Anderson, Jr. 1977 17 p Presented at 28th Natl. Plant Eng. and Maintenance Conf., Chicago, Ill., 9 May 1977

(Contract E(07-2)-1)

(DP-MS-76-84; Conf-770508-1) Avail: NTIS HC A02/MF A01

A computer program is used with a direct viewing (CRT) terminal and printout unit to provide current information on all maintenance tasks at the Savannah River Laboratory. The data, available daily to foremen, scheduling personnel, and customers, are maintained in an on-line computer program, MIACJR. Interaction through the CRT terminal allows daily revisions as work progresses, jobs are initiated or completed, or other job changes are made (such as priority). Approximately 2000 jobs, open at any one time, for 22 customer groups are monitored so that 11 craft groups may work in an orderly and efficient manner. 3 figures. ERA

N78-10733# Los Alamos Scientific Lab., N. Mex.

ROLE OF SUPERCOMPUTERS AT LASL

N. Morse, R. Mar. 1977 26 p

(Contract W-7405-eng-36)

(LA-6750-MS) Avail: NTIS HC A03/MF A01

Various options for designing a supercomputer operating system are discussed, and the favored option is specified. ERA

N78-10734# Environmental Protection Agency, Washington, D. C. Management Information and Data Systems Div.

OPERATIONS GUIDE TO REMOTE JOB ENTRY MINICOMPUTERS

May 1977 94 p refs

(PB-270055/7) Avail: NTIS HC A05/MF A01 CSCL 09B

Guidelines for standard operation and management of PDP

remote job entry minicomputers are presented in this manual.
GRA

N78-10735# Environmental Protection Agency, Washington, D. C. Management Information and Data Systems Div.
GUIDELINES FOR PREPARING MINICOMPUTERS FEASIBILITY STUDIES
Apr. 1977 42 p ref
(PB-270056/5) Avail: NTIS HC A03/MF A01 CSCL 09B
Procedures for preparing an application feasibility study for the procurement of a minicomputer are described. Factors to be analyzed include functional requirements, systems requirements, alternative equipment and hardware confugurations, and cost benefits. The standard PDP 11/70 configuration is evaluated.
GRA

N78-10736# Environmental Protection Agency, Washington, D. C. Management Information and Data Systems Div.
IMPLEMENTING PROCEDURES FOR MINICOMPUTERS
Apr. 1977 58 p ref
(PB-270057/3) Avail: NTIS HC A04/MF A01 CSCL 09B
The major activities involved in acquiring a minicomputer, once the feasibility study has been approved is described. These guidelines include ordering the equipment, planning and controlling the implementation, developing and executing a training program, preparing the site for hardware installation, and taking delivery of, installing and accepting the digital minicomputer. GRA

N78-10737# National Cancer Inst., Bethesda, Md. Image Processing Unit.
MICROPROGRAM CONTROL ARCHITECTURE FOR THE GENERAL PICTURE PROCESSOR Final Technical Report
George Carman (Carman Electronics, Inc.), Peter Lemkin, Morton Schultz, Lewis Lipkin, and Bruce Shapiro 22 Apr. 1977 35 p
(PB-269762/1; NCI/IP-77/05; FTR-22) Avail: NTIS HC A03/MF A01 CSCL 09B
Hardware design specifications are given for the microprogrammable control structure to be used for the general picture processor which runs on the real time picture processor of the image processing unit. GRA

N78-10738# National Cancer Inst., Bethesda, Md. Image Processing Unit.
BMON2: BUFFER MEMORY MONITOR SYSTEM FOR INTERACTIVE IMAGE PROCESSING Final Technical Report
Peter Lemkin 27 Jun. 1977 99 p refs Revised
(PB-269642/5; NCI/IP-77/03-Rev; NCI/IP-TR-21A-Rev) Avail: NTIS HC A05/MF A01 CSCL 09B
BMON2 PDP8e image processing system running on the image processing unit's real time picture processor (RTPP) was examined in regard to biological image processing. The RTPP consists of a PDP8e computer, quantimet 720 TV image analyzer, axiomat microscope with stage, focus and zoom stepping motor control, interactive control desk, graph pen tablet, and image buffer memory. Control of the system is effected by interaction through the teletype or control desk. Teletype commands are entered via the OS8 command decoder. About 100 operations are available. Results are converted to microns for user convenience. GRA

N78-10739# National Cancer Inst., Bethesda, Md. Image Processing Unit.
REAL TIME PICTURE PROCESSOR: DESCRIPTION Final Technical Report
Peter Lemkin, George Carman (Carman Electronics, Inc.), Lewis Lipkin, Bruce Shapiro, and Morton Schultz 23 Jun. 1977 185 p refs Revised
(PB-269600/3; NCI/IP-77/02-Rev; NCI/IP-TR-7a-Rev) Avail: NTIS HC A09/MF A01 CSCL 09B
The concepts and general design specifications of a new hardware picture processor are presented. The design was strongly influenced by the characteristics of biological images. This device, now in the early stages of construction at the National Institutes of Health, will meet some of the requirements for interactive design, specification and testing by biologists of algorithms for cell classification, description and measurement. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N78-10740 Johns Hopkins Univ., Baltimore, Md.
STRUCTURAL COMPLEXITY OF COMPUTER PROGRAMS Ph.D. Thesis
Joseph Walter Davison 1977 145 p
Avail: Univ. Microfilms Order No. 77-15070
A block-structured variant of the inductive assertion proof technique is studied. The difficulty of such a proof is related to the number of entrances and exits of each block, as well as to the number of nodes internal to a block that must be removed to break all circuits. Classes of flowcharts with these numbers as parameters are defined. The classes with single entry blocks, are studied using standard reducibility relations. It is shown that a hierarchy exists both for k, the number of exits, and for r, the cycle rank. It is also shown that cycle rank can be traded for exits. The relationship between these classes of flowcharts and current programming languages is also explored. The series of (1, n)PX sub 1 charts represents n-level repeat-exit programs. This series is shown to be naturally represented by a programming language construct similar to Zahn's Situation-Case. They are also shown to be related to the multi-level exit construct, as in Bliss. Dissert. Abstr.

N78-10741 Illinois Univ., Urbana-Champaign.
SCHEDULING PERIODIC-TIME-CRITICAL JOBS ON SINGLE PROCESSOR AND MULTIPROCESSOR COMPUTING SYSTEMS Ph.D. Thesis
Sudarshan Kumar Dhall 1977 116 p
Avail: Univ. Microfilms Order No. 77-14943
A periodic-time-critical job consists of an infinite number of requests each of which has a prescribed deadline. The scheduling problem is to specify an order in which the requests of a set of jobs are to be executed with the goal of meeting all the deadlines. Several scheduling algorithms for single processor computing systems are studied. The behavior and the efficiency of the rate-monotonic scheduling algorithm, the reverse-rate-monotonic scheduling algorithm and the deadline driven scheduling algorithm are compared. In the case of multiprocessor computing systems, instead of holding the number of processors fixed, the problem of scheduling a given set of jobs on a minimum number of processors is studied. Two heuristic algorithms which are easy to implement and according to which the number of processors required is reasonably close to the minimum number of processors needed are considered and their worst-case behavior is analyzed. Dissert. Abstr.

N78-10742 Princeton Univ., N. J.
ANALYSIS OF SOME PARALLEL SCHEDULING ALGORITHMS Ph.D. Thesis
Deepack Kumar Goyal 1976 246 p
Avail: Univ. Microfilms Order No. 77-14247
The problem of nonpreemptive scheduling of computations on systems of tasks with resource requirements is considered with the object of minimizing the total execution time. Computations are models as a partially ordered set of tasks and it is assumed that the requirements of the work load are known. Two restricted cases of processor bound systems are shown to be NP-complete and the simple level algorithm is shown to produce optimal schedules for processor bound systems having precedence graphs in the form of cyclic forests. The simple level, Coffman-Graham and Generalized Coffman-Graham algorithms are analyzed as heuristics for scheduling series-parallel structured, unit resource restricted and unequal execution time systems respectively, and bounds on their worst-case performance obtained. The model- and heuristic-dependent properties are extracted from these segments to obtain the bounds on the worst-case behavior of the heuristics. Examples are provided to establish that the bounds obtained are the best possible.
Dissert. Abstr.

N78-10743 Brown Univ., Providence, R. I.
CORRECTNESS INFLUENCED DESIGN OF PARALLEL PROGRAMMING LANGUAGES Ph.D. Thesis

Frederick Gerald Sayward 1976 241 p
Avail: Univ. Microfilms Order No. 77-14187

A parallel programming language is developed with the language design emphasis directed toward making the proof of program correctness as easy as possible. Parallel program correctness is divided into two distinct parts: functional correctness which is concerned with transforming the program's initial memory state into a desired final memory state; and communication correctness which is concerned with the interactions among processes while accessing the shared external memories and semaphores. It is shown how the language and its associated results on correctness may be extended to more complex parallel programming constructs such as the conditional critical region and arrays of semaphores. Solutions are presented for several classical parallel programming problems such as the producer-consumer problem and the five dining philosophers problem. Dissert. Abstr.

N78-10744 Brown Univ., Providence, R. I.
MODULE INTERCONNECTION IN PROGRAMMING SYSTEMS SUPPORTING ABSTRACTION Ph.D. Thesis
Joseph Wilson Thomas 1976 340 p
Avail: Univ. Microfilms Order No. 77-14201

A general framework for viewing abstraction is presented, and the programming methodologies of 'structured programming' and 'information hiding' are examined in that framework. A language for specifying module interconnections in a machine-checkable form is developed, and its incorporation into a programming system studied. An organization is suggested for programming systems which incorporate both a language processor supporting 'modular abstractions' and a module interconnection language processor for binding the modules together. The main characteristics of this organization are that it allows flexible bindings, and it provides machine-enforced documentation of the entire module interconnection structure. Dissert. Abstr.

N78-10745 Rensselaer Polytechnic Inst., Troy, N. Y.
THE PERFORMANCE OF CONVOLUTIONAL CODES ON FADING CHANNELS Ph.D. Thesis
Shou Yee Mui 1977 267 p
Avail: Univ. Microfilms Order No. 77-13713

Short constraint length convolutional codes used in conjunction with the Viterbi algorithm on both the Rician and the lognormal fading channels are examined. The modulation strategies studied include coherent binary phase-shift keying (BPSK), differential phase-shift keying (DPSK), noncoherent binary and multiple frequency-shift keying (BFSK and MFSK). The quantity of interest is the bit error probability performance as a function of the signal-to-noise ratio, parameterized by a few meaningful channel parameters. Extensive computer simulation is used to support and supplement the analysis. An empirical correspondence between the Rician and the lognormal channel parameters is developed. It is shown that under this correspondence, the coded system performance is relatively insensitive to the underlying probability distribution of the fading provided that full interleaving is employed. Dissert. Abstr.

N78-10746*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
USER'S GUIDE FOR SFTRAN/360
Theodore E. Fessler and William F. Ford Oct. 1977 51 p ref
(NASA-TP-1006; E-9264) Avail: NTIS HC A04/MF A01 CSCL 09B

Extension and improvements made to SFTRAN, a structured-programming language are discussed. This improved language is implemented as a precompiler that translates from SFTRAN to FORTRAN. The SFTRAN language and its use are described. Time-Sharing System (TSS) command procedures were implemented that eliminate the complications of dealing with extra files and processing steps which the use of a precompiler would otherwise require. These command procedures are described and their use is illustrated by examples. Author

N78-10747# Directorate of Aerospace Studies, Kirtland AFB, N. Mex.
FORTRAN SOFTWARE FOR CREATING AND MAINTAINING A LIBRARY CATALOGING SYSTEM ON SCIENTIFICALLY ORIENTED COMPUTERS. VOLUME 2: PROGRAM LIBLIST, CATALOG LISTINGS
Christopher A. Feuchter Jul. 1977 42 p ref
(AD-A042213; DAS-TR-77-3-Vol-2) Avail: NTIS MF A01 CSCL 05/2

The cataloging system of the document center of the Directorate of Aerospace Studies has been computerized on CDC 6600 computers. The system is unusual in that catalog listings of the holdings may be arbitrary in informational content, i.e., with regard to what types of information appear and their order of appearance. This volume describes LIBLIST, the FORTRAN program which produces printed catalogs from data bases maintained by its companion program ADM. The volume is a user's manual and a programmer's manual. LIBLIST is described in sufficient detail to permit its adoption to other high level computer languages and/or other large, scientifically oriented computers. GRA

N78-10748# Directorate of Aerospace Studies, Kirtland AFB, N. Mex.
FORTRAN SOFTWARE FOR CREATING AND MAINTAINING A LIBRARY CATALOGING SYSTEM ON SCIENTIFICALLY ORIENTED COMPUTERS. VOLUME 1: PROGRAM ADM, THE DATA BASE
Christopher A. Feuchter Jul. 1977 71 p 2 Vol.
(AD-A042212; DAS-TR-77-2-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 05/2

The cataloging system of the document center of the Directorate of Aerospace Studies has been computerized on the CDC 6600 computers of the Air Force Weapons Laboratory. The system is unusual in that catalog listings of the holdings may be arbitrary in informational content, i.e., with regard to what types of information appear and their order of appearance. Although its initial application was to library cataloging it may be used to catalog any collection of objects which can be described by at most 20 categories of information. This document describes ADM, the FORTRAN program which originally creates and then maintains the data base from which catalog listings are made. It is a user's manual and a programmer's manual. ADM is described in sufficient detail to permit its adoption to other high level computer languages and/or other large, scientifically oriented computers. Author (GRA)

N78-10749# Naval Postgraduate School, Monterey, Calif.
A MICROPROCESSOR IMPLEMENTATION OF EXTENDED BASIC M.S. Thesis
Gordon Edwin Eubanks, Jr. Dec. 1976 195 p refs
(AD-A042332) Avail: NTIS HC A09/MF A01 CSCL 09/2

The design and implementation of an extension to the BASIC programming language for use on a microprocessor-based system has been described. The implementation is comprised of two subsystems, a compiler which generates code for a hypothetical zero-address machine and a run-time monitor which interprets this code. The design goals, solutions, and recommendations for further expansion of the system have been presented. The system was implemented in PL/M for use in a diskette-based environment. Author (GRA)

N78-10750# Doty Associates, Rockville, Md.
SOFTWARE COST ESTIMATION STUDY. VOLUME 1: STUDY RESULTS Final Technical Report, 23 Feb. 1976 - 23 Feb. 1977
J. H. Herd, John N. Postak, William Russell, and Kenneth R. Stewart Griffiss AFB, N. Y. RADC Jun. 1977 214 p refs (Contract F30602-76-C-0182)
(AD-A042264; TR-151; RADC-TR-77-220-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 09/2

The study identified factors that have an adverse effect on software cost estimates, determined their impact on software cost estimates, discussed methods for controlling the effect of these factors, and developed an overall methodology for estimating the costs of software development. In addition to a generalized model for estimating software development costs, separate models have been generated for estimating the development cost of command and control, scientific, utility, and business software. Author (GRA)

N78-10751# Ohio State Univ., Columbus. Dept. of Computer and Information Science.
CIRC 2 DATA BASE CLASSIFICATION Final Technical Report, 1 Jan. 1976 - 31 Mar. 1977
Lee J. White, Anthony E. Petrarca, Laurel G. Crawford, Barry J. Brinkman, and Sanjay Mittal Jun. 1977 118 p refs
(Contract F30602-76-C-0102)
(AD-A042268; RADC-TR-77-211) Avail: NTIS HC A06/MF A01 CSCL 05/2

This report describes the development of a classification system for the CIRC II Data Base. 98 CIRC II classes are designed which partition the documents of this data base. The software which assigns these classes to incoming documents utilizes a sequential classification algorithm. In this approach, only as much of each document is read to accurately assign one or more classes, together with a confidence probability for each assigned class. In this way, a compromise is obtained between efficiency and accuracy. A number of parameters are available in this software to effect this trade off. Additional software has been developed to analyze sample documents to define the CIRC II classes, producing keywords and frequency distributions over the classes. This software provides flexibility for the classification system, as a class can be added or deleted, a class modified by submitting additional documents, or the keyword selection criterion can be altered. A number of experiments were conducted using this classification system on CIRC II documents. It was shown that satisfactory classification could be achieved, and a stable set of keywords and frequency distributions obtained.
Author (GRA)

N78-10752# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
SOFTWARE SYSTEMS DEVELOPMENT: A CSDL PROJECT HISTORY Final Technical Report, 1967 - 1971
P. Rye, F. Bamberger, W. Ostanek, N. Brodeur, and J. Goode Jun. 1977 99 p refs
(Contract F30602-76-C-0151)
(AD-A042186; R-1073; RADC-TR-77-213) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report provides a description of the data delivered to RADC for inclusion in a Software Data Repository. The data consists of a complete history of software modifications to the APOLLO on-board flight software for the period 1967 through 1971. Background material on the project that was the source of the data is provided, as well as tabular and graphic summaries of the data. Some recommendations for future work are made.
Author (GRA)

N78-10753# Wisconsin Univ., Madison. Mathematics Research Center.
ON CONE ORDERINGS AND THE LINEAR COMPLEMENTARITY PROBLEM
Jong-Shi Pang Jun. 1977 21 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-75-17385)
(AD-A042731; MRC-TSR-1757) Avail: NTIS HC A02/MF A01 CSCL 12/2

This paper first generalizes a characterization of polyhedral sets having least elements, which is obtained by Cottle and Veinott, to the situation where Euclidean space is partially ordered by some general cone ordering (rather than the usual ordering). We then use this generalization to establish the following characterization of the class C of matrices (C arises as a generalization of the class of Z-matrices, M is a member of C if and only if for every vector q for which the linear complementarity problem (q,M) is feasible, the problem (q,M) has a solution which is the least element of the feasible set. GRA

N78-10754# Air Force Human Resources Lab., Brooks AFB, Tex. Computational Sciences Div.
AUTOMATIC INTERACTION DETECTOR-VERSION 4 (AID)-4. REFERENCE MANUAL, ADDENDUM 1 Final Report, Oct. 1973 - Apr. 1977
C. Deane Gott and Janos B. Koplyay Jul. 1977 14 p refs
(AF Proj. 6323)
(AD-A042968; AFHRL-TR-77-30-Add-1) Avail: NTIS HC A02/MF A01 CSCL 09/2

This document serves as the addendum to the AID-4 Reference Manual. The addendum describes changes to the original reference manual, technical notes on certain aspects of the program not mentioned before, and supplemental information to assist in running the AID-4 package on the UNIVAC 1108 computer. GRA

N78-10755# Naval Research Lab., Washington, D. C.
USE OF ABSTRACT INTERFACES IN THE DEVELOPMENT OF SOFTWARE FOR EMBEDDED COMPUTER SYSTEMS Interim Report
David L. Parnas 3 Jun. 1977 34 p refs
(XF21241021)
(AD-A043369; NRL-8047) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes a procedure for designing computer systems that are developed specifically to be a component of a more complex system. Two significant characteristics of such design problems are the following: the computer system interface is determined by factors outside the control of the computer system designer, and the specifications of that interface are likely to change throughout the life cycle of the system. The purpose of the procedure described in this report is to reduce maintenance costs by means of a software organization that insulates most of the programs from changes in the interface. The procedure is based on the systematic compilation of an assumption list. The assumption list describes those aspects of the interface that future users and other knowledgeable persons consider essential and therefore stable. Other aspects of the interface are ignored. An abstract interface is designed on the basis of this assumption list. A specification of the abstract interface is used to procure the major compoñents of the system. This report explains the principles behind the procedure and illustrates its use. The success of the procedure is primarily limited by the ability of designers and future users to compile an accurate list of assumptions. A side benefit of the procedure is simpler, better structured software. Successful application of the procedure should result in both increased reliability and reduced lift-cycle costs.
Author (GRA)

N78-10756# Ballistic Research Labs., Aberdeen Proving Ground, Md.
ESTIMATION OF PRECISION OF MEASUREMENT AND PRODUCT VARIABILITY: A COMPUTER MODEL
James F. OBryon Aug. 1977 39 p
(DA Proj. 1L6-62618-AH-80)
(AD-A043783; BRL-MR-2778) Avail: NTIS HC A03/MF A01 CSCL 14/2

When two or more instruments are used to simultaneously measure the same phenomena, it is possible, with a few assumptions, to obtain the most efficient unbiased estimator for the precision of measurement of each instrument as well as an estimation of the true variability of the event being observed. A computer program written in FORTRAN IV which performs these calculations is presented and discussed. Up to 10 instruments taking simultaneous measurements can be handled for a series of up to 50 observations per instrument. Provision is also made to determine whether any given instrument is performing significantly different statistically from other instruments measuring simultaneously. Sample examples are also included to illustrate the program's usage and flexibility. Author (GRA)

N78-10757# Stanford Research Inst., Menlo Park, Calif.
IS SOMETIME SOMETIMES BETTER THAN ALWAYS? INTERMITTENT ASSERTIONS IN PROVING PROGRAM CORRECTNESS
Zohar Manna and Richard Waldinger Mar. 1977 43 p refs
(Contracts N00014-75-C-0816; Contracts N00014-76-C-0687; MDA903-76-C-0206; Grant NSF DCR-72-03737)
(AD-A043498; SRI-0816-7) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper explores a technique for proving the correctness and termination of programs simultaneously. This approach, is called the intermittent-assertion method, involves documenting the program with assertions that must be true at some time when control passes through the corresponding point, but that need not be true every time. The method promises to provide a valuable complement to the more conventional methods. GRA

N78-10758# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.

ON THE DESIGN AND VERIFICATION OF OPERATING SYSTEMS Ph.D. Thesis Interim Report
Lawrence Flon May 1977 104 p refs
(Contract F44620-73-C-0074; Grant NSF DCR-74-24573)
(AD-A043452; AFOSR-77-1139TR) Avail: NTIS HC A06/MF A01 CSCL 09/2

This thesis applies and extends mathematical program verification to systems programs. The design methodology is based upon the use of abstract data types and the construction and verification of both specifications and implementations for them. The abstract data type is a means of modularization which encapsulates the representation of a data structure and the algorithms which operate directly upon it. The specification technique appeals to various mathematical structures (e.g. sets and sequences) to describe an abstract state for objects of a given type. The correctness of the formal specifications is cast in terms of the proof of certain invariant properties of the abstract state. An axiomatic proof rule is given to formulate the theorems necessary for proving the invariance of predicates across formal specifications. The applicability of the methodology to operating systems is explored. It is found that a hierarchical decomposition is most amenable to verification, and that the implementation language used is a function of that hierarchy. The example of a process dispatcher module of a hypothetical operating system is used to illustrate the process of design, specification, implementation, and verification using the methodology. Various properties are proven of the abstract specifications, including one representation of the concept of fair service. Programs are then written for the specifications and their correctness is verified. GRA

N78-10759# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
NONDETERMINISM AND THE CORRECTNESS OF PARALLEL PROGRAMS Interim Report
Lawrence Flow and Norihisa Suzuki May 1977 24 p refs
(Contract F44620-73-C-0074; Grant NSF DCR-74-24573)
(AD-A043450; AFOSR-77-1137TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This paper presents the weakest preconditions which describe weak correctness, blocking, deadlock, and starvation for nondeterministic programs. A procedure for converting parallel programs to nondeterministic programs is described, and the correctness of various example parallel programs is treated in this manner. Among these are a busy-wait mutual exclusion scheme, and the problem of the Five Dining Philosophers. GRA

N78-10760# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
VERIFICATION DECIDABILITY OF PRESBURGER ARRAY PROGRAMS Interim Report
Norihisa Suzuki and David Jefferson 14 Jun. 1977 23 p refs
(Contracts F44620-73-C-0074; DAHC15-72-C-0308)
(AD-A043451; AFOSR-77-1138TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

A program annotated with inductive assertions is said to be verification decidable if all of the verification conditions generated from the program and assertions are formulas in a decidable theory. The Presburger array theory, is defined, containing two logical sorts: integer and array-of-integer. Addition, subtraction, and comparisons are permitted for integers. Array contents and assign functions, and, since the elements of the arrays are integers, array accesses may be nested. The first result is that the validity of unquantified formulas in Presburger array theory is decidable, yet quantified formulas in general are undecidable. GRA

N78-10761# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
PROGRAM STRUCTURES FOR EXCEPTIONAL CONDITION HANDLING Interim Report. Ph.D. Thesis
Roy Levin Jun. 1977 170 p refs
(Contract F44620-73-C-0074)
(AD-A043449; AFOSR-77-1136TR) Avail: NTIS HC A08/MF A01 CSCL 09/2

The goal of much of the current research in the field of structured programming is to develop a methodology that materially aids in the construction of clearly understandable yet rigorously verifiable programs. No single methodology has achieved pre-eminence, but some common threads run through all the serious contenders. To achieve clarity of expression, most methodologies postulate a small number of easily-described primitive programming constructs. These constructs then become the building blocks for programs that exhibit an orderly arrangement of data and disciplined transfers of control. GRA

N78-10762# Naval Research Lab., Washington, D. C. Space Systems Div.
SOLUTION OF THE PERTURBED HARMONIC OSCILLATOR BY COMPUTER Final Report
K. T. Alfriend and H. M. Pickard May 1977 31 p refs
(RR0140241)
(AD-A043438; NRL-MR-3513) Avail: NTIS HC A03/MF A01 CSCL 09/2

A FORTRAN program has been developed for solving non-linear differential equations of the form dX/d-X-epsilon f(X;epsilon) = 0 using Lindstedt's method. This method provides a uniformly valid series solution by introducing a transformation in the time variable via a scale factor which is a power series in the small parameter epsilon. Secular terms which cause non-uniformity may be then constrained to disappear. The details of the method are carried out using an algebraic manipulation package. The use of the computer program is discussed and examples are supplied. Author (GRA)

N78-10763# Maryland Univ., College Park. Dept. of Computer Science.
A FAMILY OF H-GRAPH MODELS FOR SIMPL-T Interim Report
Susan J. Gorlin Jul. 1977 103 p refs
(Grant AF-AFOSR-3181-77)
(AD-A043380; TR-552; AFOSR-77-0948TR) Avail: NTIS HC A06/MF A01 CSCL 09/2

This paper illustrates the advantage of modeling in the design of a language. An h-graph model is constructed to reflect the basic version of SIMPL-T. As new features are added to the language, the model is extended accordingly. Several h-graph models are presented. The first describes the basic version of SIMPL-T which recognizes integer as its only data type. The model is then extended to reflect the addition of escape mechanisms to SIMPL-T. The EXIT and ABORT statements have been added, whereas the RETURN statement has been assigned an expanded role. Because modeling provides a rigorous definition of the language, the effects of changes made to the language can be detected in the model. New features can be added without sacrificing the reliability of the original language. The family of h-graphs presented in this paper supports these contentions. GRA

N78-10764# Harvard Univ., Cambridge, Mass.
RECENT DEVELOPMENTS IN THE ECL PROGRAMMING SYSTEM Final Technical Report, 17 Sep. 1973 - 16 Mar. 1977
Thomas E. Cheatham, Jr. Jul. 1977 38 p refs
(Contract F30602-74-C-0032)
(AD-A043487; RADC-TR-77-249) Avail: NTIS HC A03/MF A01 CSCL 09/2

Aspects of the development of the ECL Programming System are presented. ECL is built around the extensible programming language EL1. Specifically, the material deals with debugging facility, measurement aids, and optimization mechanisms in ECL, symbolic evaluation of EL1 programs, and the design and development of a subset of the full EL1 language particularly suited to systems programming. Author (GRA)

N78-10765# Stanford Univ., Calif. Dept. of Computer Science.
COMPLEXITY OF COMBINATORIAL ALGORITHMS
Robert E. Tarjan Apr. 1977 89 p refs
(Contract N00014-76-C-0668; Grant NSF MCS-75-22870)
(AD-A043362; SU-STAN-CS-77-609) Avail: NTIS HC A05/MF A01 CSCL 09/2

This paper examines recent work on the complexity of combinatorial algorithms, highlighting the aims of the work, the mathematical tools used, and the important results. Included are sections discussing ways to measure the complexity of an

algorithm, methods for proving that certain problems are very hard to solve, tools useful in the design of good algorithms, and recent improvements in algorithms for solving ten representative problems. The final section suggests some directions for future research. Author (GRA)

N78-10766# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
USE OF ANALOGY TO ACHIEVE NEW EXPERTISE M.S. Thesis
Richard Brown Apr. 1977 147 p refs
(Contract N00014-75-C-0643)
(AD-A043809; AI-TR-403) Avail: NTIS HC A07/MF A01 CSCL 06/4

A new theory will be presented in which analogy is viewed as a process that writes expert problem-solving programs. Algorithms will be presented which are used in this theory and will illustrate the operation of these algorithms in six examples. In this theory, the analogy process reasons between different problem worlds. Four different pairs of problem worlds will be used in these examples with special attention given to geometry world (plane and solid geometry). Theoretical limitations and psychological validity are discussed. Author (GRA)

N78-10767# California Univ., Santa Cruz.
ERROR RECOVERY FOR LR PARSERS M.S. Thesis
Thomas Julian Pennello Jun. 1977 62 p refs
(Contract N00014-76-C-0682)
(AD-A043470; TR-77-7-002) Avail: NTIS HC A04/MF A01 CSCL 09/4

A practical algorithm is described that allows an LR parser to parse past the point at which an error was detected. By thus parsing, context beyond the point of error detection is gathered. Several important properties about this forward context are proven its usefulness in the selection and evaluation of error repairs is demonstrated. At first specifically restricting the consideration to single occurrences of errors of insertion, deletion, or replacement of a single terminal symbol, the algorithm is given with suggested possible error repair strategies. Then a generalization to encompass recovery from any number and type of error is given. GRA

N78-10768# Naval Surface Weapons Center, Dahlgren, Va.
COMPUTATION OF THE PERCENTAGE POINTS OF THE CHI-SQUARE DISTRIBUTION
A. R. DiDonato and R. K. Hageman Apr. 1977 199 p
(AD-A043997; NSWC/DL-TR-3569) Avail: NTIS HC A09/MF A01 CSCL 12/1

A FORTRAN IV program is developed for computing the percentage points of the Chi-square distribution. The Newton-Raphson procedure is used with good initial approximations. The maximum number of iterations is four and in most cases only one or two are needed. An extensive table is given of the percentage points Chi squared in terms of nu, a positive number, and Q(nu/Chi squared), the probability integral of the Chi-square distribution. Author (GRA)

N78-10769# Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.
CDC6600 SUBROUTINE FOR NORMAL RANDOM VARIABLES
Donald E. Amos Apr. 1977 7 p refs
(Contract EY-76-C-04-0789)
(SAND-77-0612) Avail: NTIS HC A02/MF A01

A value y for a uniform variable on (0,1) is generated and a table of 96 percent points for the (0,1) normal distribution is interpolated for a value of the normal variable x(0,1) on 0.02 less than or equal to y less than or equal to 0.98. For the tails, the inverse normal is computed by a rational Chebyshev approximation in an appropriate variable. Then X = x sigma + mu gives the X(mu sigma) variable. ERA

N78-10770# New York Univ., N. Y.
ECONOMICS OF PROPERTY RIGHTS AS APPLIED TO COMPUTER SOFTWARE AND DATA BASES
Yale M. Braunstein and Deitrich M. Fischer Jun. 1977 131 p refs Sponsored by the National Commission on New Technological Uses of Copyrighted Works
(PB-268787/9; CONTU-77-0005) Avail: NTIS HC A07/MF A01 CSCL 09B

Several major discussions are reviewed. The first of which qualitatively compares the relative incentives to computer software producers found in alternative regimes of copyright and trade secrecy. The latter is found to have certain dysfunctional qualities which copyright might ameliorate. The second discussion provides a critical view of exemptions from copyright for broad classes of users. Exemptions decrease economic efficiency which would be increased through user charges. The third section creates a model of software production and protection and indicates that the term of copyright protection for software should be very short. The final chapter analyzes the tradeoff between the scope of protection and the length of time for which the protection lasts. It finds that the more there is of one, the less there needs to be of the other. Author

N78-10771# National Bureau of Standards, Washington, D. C. Systems and Software Div.
COMPUTER SCIENCE AND TECHNOLOGY: FEATURES OF SEVEN AUDIT SOFTWARE PACKAGES. PRINCIPLES AND CAPABILITIES
Albrecht J. Neumann Jul. 1977 62 p refs
(PB-269942/9; NBS-SP-500-13; LC-77-608147) Avail: NTIS HC A04/MF A01 CSCL 05A

The objectives of the auditing process are illustrated by a review of auditing standards for external and internal auditors. Some basic concepts of auditing are defined. Methods for computerized internal control are outlined. Characteristics and features for seven major commercially available audit software packages are described under common headings dealing with the computer environment, input file characteristics, history, availability and cost, and general system characteristics. Basic functions and specialized audit functions of software packages such as numerical and logical operations, stratification and aging, selection, and summarization are described for the various packages. GRA

N78-10772# National Bureau of Standards, Washington, D. C. Inst. for Computer Sciences and Technology.
CROSSI: A UNIVAC PROCESSOR WHICH ASSEMBLES CODE FOR INTERDATA MINICOMPUTERS
Carol V. Young Apr. 1977 34 p refs
(PB-269344/8; NBSIR-77-1230) Avail: NTIS HC A03/MF A01 CSCL 09B

Instructions are given for the use of Crossi, a computer program which assembles Interdata assembler code on the Univac 1108, producing an assembler listing and relocatable code for the minicomputer. The assembler statements, relocatable output formats and the structure of the processor are described. A preprocessor is given for converting Crossi's zoned relocatable format to interdata's zoned relocatable format. A method of reconfiguring the Crossi processor to assemble code for newer upward compatible minicomputer models is explained. GRA

62 COMPUTER SYSTEMS

Includes computer networks.

N78-10773 Massachusetts Univ., Amherst.
SCHEDULING THE CENTRAL PROCESSING UNIT IN A PRODUCT INFORMATION SYSTEM Ph.D. Thesis
F. Paul Fuhs 1977 388 p
Avail: Univ. Microfilms Order No. 77-13812

The relative effect of three central processing units (CPU) scheduling disciplines on system response time and lost potential sales under various conditions of CPU utilizations, main memory capacity, and paging loads on secondary storage devices was examined. These three factors form a three dimensional system space in which the CPU scheduling disciplines are studied. A model of a product information system is developed and a computer simulation of the model is used as an experimental tool to study the behavior of the three CPU scheduling disciplines. It was demonstrated that when main memory capacity is not sufficient and the paging of program pages is required, in a virtual storage environment, the relative ranking of the three

scheduling disciplines can be affected. Discipline three is shown to be superior over a wider range of CPU utilizations and secondary storage device loadings, given demand program paging, than when the system is run under memory sufficiency. This is due to the fact that in a virtual storage environment the number of times priority setting occurs per query is increased. This results in a greater priority setting sensitivity for discipline three.
Dissert. Abstr.

N78-10774 Massachusetts Univ., Amherst.
A DATABASE MANAGEMENT FACILITY AND ARCHITECTURE FOR THE REALIZATION OF DATA INDEPENDENCE Ph.D. Thesis
David Wilber Stemple 1977 236 p
Avail: Univ. Microfilms Order No. 77-15127

The data base facility consists of a high level data control language, a pseudo-machine language, a compiler from the high level to the pseudo-machine language, and an interpreter for the pseudo-machine language. A major feature of the architecture is the generation, from non-procedural schemas, of data base managers written in the high level data control language and tailored to the individual schemes. A second significant feature of the architecture is the use of multiple levels of optional binding. The architecture reflects the decomposition of data independence into vertical and horizontal data independence. Vertical data independence is the freedom to change lower level realizations of data structures and manipulations without changing the responses of higher level queries. Dissert. Abstr.

N78-10775 New Mexico State Univ., University Park.
IDENTIFICATION AND MODELING OF LINEAR SYSTEMS WHEN STATISTICS ARE UNKNOWN Ph.D. Thesis
Judith Gleason Claassen 1977 154 p
Avail: Univ. Microfilms Order No. 77-14308

A new procedure for unbiased estimation of parameters is developed in which no knowledge of the statistics of the input, or of the output measurement error, is required. The procedure is applicable to linear, discrete-time Systems with constant parameters and of unknown order. An algorithm which is sequential and is computationally practical for on-line application is derived. It is based on a specific mathematical rule which assures minimization of error criteria and achieves an unbiased estimate of the convolution weights of the impulse response. A procedure for determining the order of the system is derived, as is a stopping criterion for the algorithm. Dissert. Abstr.

N78-10776 Illinois Univ., Urbana-Champaign.
TOPICS IN MOSFET NETWORK DESIGN Ph.D. Thesis
Jay Niel Culliney 1977 329 p
Avail: Univ. Microfilms Order No. 77-14942

After briefly reviewing several existing optimal network synthesis methods, new methods based on a redefined concept of 'clusters' are proposed to obtain improved synthesis results. Transformations of MOS networks are discussed which are based only upon the configurations of the networks and the individual MOS cells. These are suitable for use without the aid of a computer. A new approach to negative gate network synthesis is presented. This approach basically consists of procedures for the transformation and reduction (referred to as 'transduction procedures') of existing networks in order to obtain simplified networks. A method is proposed for the generation of reduced test sets for the diagnosis of irredundant MOS networks synthesized by Lai's algorithm. The generation is most conveniently accomplished during the process of synthesizing the irredundant networks. Dissert. Abstr.

N78-10777 Hawaii Univ., Honolulu.
CONNECTIVITY OF RANDOM NETWORKS Ph.D. Thesis
Viqar Ahmed Minai 1976 145 p
Avail: Univ. Microfilms Order No. 77-14600

A new propagation model has been developed for determining an approximate value of the weak connectivity constant of homogeneous random graphs. The new model takes into consideration the possibility of termination of the message propagation process at any intermediate step. An exact recursive approach has been developed for determining the weak connectivity constant of outbundle independent homogeneous random graphs. It is shown that the recursive approach can be used in an indirect manner to determine the weak connectivity constant of inbundle independent homogeneous random graphs. A homogeneous cluster random graph model is proposed for communication networks with geographical distance bias where the vertex set of the random graph is partitioned into smaller subsets such that the distances between vertices in the same cluster are approximately equal. Dissert. Abstr.

N78-10778# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
WORKLOAD CHARACTERIZATION AND MEASUREMENT OF THE CDC CYBER 74 COMPUTER SYSTEM M.S. Thesis
Jonathan R. Bear Mar. 1977 235 p
(AD-A042184; AFIT/GCS/MA/77M-1) Avail: NTIS HC A11/MF A01 CSCL 09/2

In evaluating computer performance, the choice of evaluation approach depends upon the objectives of the investigation. Basically, the methodology involves observing and measuring the computer system or its model while a set of jobs, or workload, is processed. Computer performance evaluation can be divided into 2 focal points: the computer system and its workload. This thesis focuses upon the workload. A methodology was developed to process accounting data generated by the control Data Corporation CYBER 74 computer system. A number of statistical tools were used to measure several representative days of accounting data. The workload was characterized by use of a variety of statistical techniques, and the effect of variations in the workload upon computer system performance was measured. The methodology developed for this investigation and the results obtained could be used as a preliminary step in a performance evaluation of the CYBER 74 computer system. GRA

N78-10779# Hawaii Univ., Honolulu.
AN INVESTIGATION OF COMPUTER SYSTEMS PROBLEMS Final Report, 1 Mar. 1974 - 15 Apr. 1977
W. W. Peterson and A. Lew Apr. 1977 28 p refs
(Grant DAAG29-74-G-0110)
(AD-A042230; ARO-11944.16-M) Avail: NTIS HC A03/MF A01 CSCL 09/2

The main computer system problem areas investigated were concerned with multiprogramming and paging systems, diagnostic compilers and debugging, and decision tables. Related areas investigated include Petri nets, grammatical inference, and mathematical optimization techniques. Author (GRA)

N78-10780# California Univ., Livermore. Lawrence Livermore Lab.
NEW DESIGN FOR INTERFACING COMPUTERS TO THE OCTOPUS NETWORK
Lansing J. Sloan 14 Mar. 1977 14 p refs Presented at Conf. on Expt. in New Approaches to Local Computer Networking, Minneapolis, 16-17 Sep. 1976
(Contract W-7405-eng-48)
(UCRL-79161; Conf-760972-2) Avail: NTIS HC A02/MF A01

Tentative plans for the deployment of large scale computers to be connected to the Octopus network, and providing service similar to that now received by users are discussed. The network is described as well as its present hardware structure, some properties of the software, various problems of the Octopus system, and current tentative ideas for solving the problems are studied. ERA

N78-10781# Los Alamos Scientific Lab., N. Mex.
OVERVIEW OF LASL INTEGRATED COMPUTER NETWORK
H. F. Kelso Jan. 1977 15 p
(Contract W-7405-eng-36)
(LA-6757-MS) Avail: NTIS HC A02/MF A01

An overview of the history, design philosophy, implementation, and future plans for the LASL integrated computer network and its use in both a production and time-sharing environment is presented. ERA

N78-10782# Massachusetts Inst. of Tech., Cambridge. Electronic Systems Lab.
COMPUTER INTERFACES FOR USER ACCESS TO HETER-

OGENEOUS INFORMATION: RETRIEVAL SYSTEMS Final Report, Nov. 1975 - Apr. 1977
Richard S. Marcus and J. Francis Reintjes Apr. 1977 93 p refs
(Grant NSF SIS-75-22946)
(PB-269126/9; ESL-R-739) Avail: NTIS HC A05/MF A01 CSCL 09B

A translating-computer-interface approach to providing a common, or virtual-system, mode of access to a network of heterogeneous online bibliographic retrieval systems was investigated. Enhanced access to such systems by end users was demonstrated through test usage of an experimental interface. A table-test rule-based message interpreter that provides a dynamic and flexible means for handling the automation of the interconnection of computer and human retrieval protocols was found useful in implementing the interface. Experimental analysis has demonstrated the success of various computer-assisted instructional techniques, as well as indicated basic tradeoffs and limitations in their implementation in working systems. GRA

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N78-10783 New Mexico State Univ., University Park.
APPLICATION OF AUTOMATA THEORY TO PICTURE MODELING Ph.D. Thesis
Jose Antonio Vilela 1977 136 p
Avail: Univ. Microfilms Order No. 77-14314

Pattern recognition and classifications problems were investigated. A system was designed and hardware implemented to recognize and classify nine cotton insects. Size, shape, color, and color connectivity are the features measured and utilized to classify the insects. Simply connected polygons were modeled as linear graphs. A set of basic components is presented in which any polygon can be expressed as an ordered subset. A system was designed which detects and encodes polygon side slopes and partitions poloygons into the basic components. Algorithms to show that the models are equivalent are given and implemented in a FORTRAN program which also computes any one of the models using the vertices of the polygon as inputs. Dissert. Abstr.

N78-10784 Massachusetts Univ., Amherst.
DESIGNING SIMPLE FEEDBACK CONTROL SCHEMES FOR MULTIVARIABLE PROCESSES BY UNDERSTANDING DYNAMIC INTERACTION Ph.D. Thesis
Mark Fredrick Witcher 1977 370 p
Avail: Univ. Microfilms Order No. 77-15139

The dynamic behavior of multivariable processes is analyzed with the objective of producing a usable control scheme design methodology. After a brief literature survey and a discussion of the fundamental economic considerations, the interactions in multivariable processes are discussed with the goal of developing a simple, straightforward technique for designing multivariable controllers using conventional algorithms and equipment. The control scheme design methodology developed is based on the idea that the primary consideration in the design procedure is the extent to which each manipulated variable influences each measured variable. The Relative Dynamic Array, which is an extension of Bristol's Relative Gain Array, is developed as a means of understanding the interacting process by comparing its noninteracting behavior to its partially decoupled behavior. Dissert. Abstr.

N78-10785 Brown Univ., Providence, R. I.
OPTIMAL CONTROL OF BILINEAR SYSTEMS WITH SOME AEROSPACE APPLICATIONS Ph.D. Thesis
Kuang-Chung Wei 1976 135 p
Avail: Univ. Microfilms Order No. 77-14206

The optimal control of bilinear systems with quadratic cost is discussed. The existence of an optimal solution to this problem was derived. The uniqueness of the optimal control to the minimum energy problem associated with a class of commutative bilinear systems is shown. The minimum energy control of commutative bilinear systems was found to be in a very simple form, i.e., a constant vector determined through the boundary conditions. The communitivity property also led to a striking characteristic of the reachable set in that the system was reachable x sub 1 if and only if it is constant reachable to x sub 1. This implied a great deal of flexibility in the design of a simple and feasible controller which drove the system to the desired target. Applications to a two-dimensional pursuit-evasion problem as well as a gliding parachute system in a nonuniform wind were studied. Dissert. Abstr.

N78-10786# Illinois Univ., Urbana-Champaign. Coordinated Science Lab.
SENSITIVITY OF LOWER ORDER OBSERVERS M.S. Thesis
Erwin DeSa Mar. 1977 84 p refs
(Contract DAAB07-72-C-0259; Grant AFOSR-2570-73)
(AD-A042645; R-762; UILU-ENG-77-2209) Avail: NTIS HC A05/MF A01 CSCL 12/2

The problem of sensitivity of dynamic systems to changes in parameters is of great importance because, in physical realization of automatic control systems, changes in the parameters always are encountered -- as a result of aging of the elements, effects of the external environment, interactions with other systems, etc. Contemporary automatic control systems often are realized as systems of variable structure where the possibility of varying the parameters of the system is specially introduced to obtain adaptation properties. In all these cases, the question arises as to how the behavior of the system changes when changes occur in certain of its parameters. One such system of interest is the lower order observer or lower order estimator. Determination of changes in the performance of the lower order observer to changes in parameters is of great importance in engineering analysis and design. The significance of using lower order observers instead of a full order observer, when a few states are needed to be estimated, is of an economical nature. Sometimes it is needed that the estimated state be highly nonsensitive to parameter variations, the economic reasons are then superseded by sensitivity. Therefore, a comparison in sensitivity is needed between the lower order, and full order, observers. GRA

N78-10787# Maryland Univ., College Park.
OPTIMAL AND HEURISTIC SYNTHESIS OF HIERARCHICAL CLASSIFIERS Ph.D. Thesis
Ashok Vasant Kulkarni Aug. 1976 188 p
(Grants AF-AFOSR-2901-76; Contract NSF ENG-73-04099)
(AD-A042161; AFOSR-77-0825TR) Avail: NTIS HC A10/MF A01 CSCL 09/4

Multistage schemes such as hierarchical classifiers have been found useful for many multiclass pattern recognition tasks. This dissertation investigates the theoretical properties of a general model of multistage multiclass recognition schemes. The generality of the model allows one to describe a large class of parametric and non-parametric schemes commonly used in terms of the model parameters. Hierarchical classifiers are special types of multistage recognition schemes wherein at each stage certain classes are rejected from consideration as labels of the test sample. Theoretical properties of decision trees whose node decisions are statistically independent are investigated. Even under this independence assumption the optimal tree design task is a complex one. GRA

N78-10788# Maryland Univ., College Park. Computer Science Center.
CELLULAR PYRAMIDS FOR IMAGE ANALYSIS Interim Technical Report
Charles R. Dyer and Azriel Rosenfeld May 1977 48 p refs
(Grants AF-AFOSR-3271-77)
(AD-A042156; AFOSR-77-0807TR) Avail: NTIS HC A03/MF A01 CSCL 09/4

A class of multilayer bounded cellular arrays is defined for which many useful recognition tasks require time proportional to the logarithm of the diameter of the input. Author (GRA)

N78-10789# Illinois Univ., Urbana-Champaign. Coordinated Science Lab.
AN EFFICIENT ALGORITHM FOR THE SPECTRA OF BLOCK

CODED PAM SIGNALS
Val DiEuliis Jun. 1977 27 p refs
(Contracts DAAB07-72-C-0259; NSF ENG-75-22621)
(AD-A042648; R-771; UILU-ENG-77-22) Avail: NTIS HC A03/MF A01 CSCL 09/4

The power spectral density of multi-level coded sequences has been an important factor in the design of PCM transmission schemes. The spectral density for symbol-by-symbol encoding schemes was first derived by Bennett. In the past few years, several algorithms for block encoded schemes have been proposed. The most recent algorithm is based on a generalization of Bennett's formula and a compact notation for finite state machine encoders. This paper derives closed form expressions for the covariance sequences of multi-level block coded sequences and relates these covariance coefficients to Bennett's formula such that the ensuing algorithm is more efficient in time and memory.
Author (GRA)

N78-10790# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
EXTRACTING AND LABELLING BOUNDARY SEGMENTS IN NATURAL SCENES
J. M. Prager, A. R. Hanson, and E. M. Riseman May 1977 57 p refs
(AD-A043669; COINS-TR-77-7) Avail: NTIS HC A04/MF A01 CSCL 06/4

This paper describes a set of programs used to perform boundary-analysis in the VISIONS scene-analysis system. These programs lead the data through a sequence of transformations: preprocessing, differentiation using a very simple operator, relaxation using case-analysis, and postprocessing. The output of the system is a set of labelled line-segments for which features such as length and confidence are computed. The lines and associated features will be passed to other portions of the VISIONS system for further analysis. Author (GRA)

N78-10791# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
REGION EXTRACTION AND DESCRIPTION THROUGH PLANNING
Paul A. Nagin, Allen R. Hanson, and Edward M. Riseman May 1977 57 p refs
(Contract N00014-75-C-0459)
(AD-A043676; COINS-TR-77-8) Avail: NTIS HC A04/MF A01 CSCL 06/4

This paper examines several image segmentation algorithms which have been explored in the development of the VISIONS system. Each of these algorithms can be viewed as a variation on a basic theme: the clustering of activity in feature space via histogram analysis, mapping these clusters back onto the image, and then isolating regions by analysis of the spatial relationships of the cluster labels. It is shown that the interaction between these two representations of data (global feature information and spatial information) provides a view that is lacking in either. The scene segmentation algorithms contain the following stages: (1) PLAN: reduce the amount of detail in the scene to a bare minimum by performing a fast simple segmentation into primary areas using spatial and/or quantization compression. (2) REFINE: resegment the scene with careful attention directed to the textural complexities of each region. The primitive transformations which are used include histogram clustering, region growing, data reduction by narrowing the quantization range, and/or data reduction by spatially collapsing the data while extracting features. These algorithms have been implemented using a parallel, hierarchical computational structure. Comparisons of performance on several images are given.
Author (GRA)

N78-10792# Syracuse Univ., N. Y. Dept. of Industrial Engineering and Operations Research.
OPTIMAL CONTROL OF RANDOM WALKS Interim Report
Richard F. Serfozo 1977 38 p refs
(Grants AF-AFOSR-2627-74; NSF ENG-75-13653)
(AD-A043521; AFOSR-77-1011TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

This is a study of a random walk on the nonnegative integers whose steps are controlled as follows. Upon arriving at a location i, a pair of probabilities (p,q) is selected from a prescribed set, a reward r(i,p,q) is received and the next step takes the walk to locations i-1, i-1, or i, with respective probabilities p, q and 1-p-q (when i=0 these probabilities are p, 0 and 1-p). This is repeated indefinitely. A rule for successively selecting the probabilities (p,q) is a control policy. Conditions are identified on the rewards and probabilities under which there exist monotonic optimal policies for discounted and average rewards. For example, in one case it is optimal to increase the probability of backward steps as the location i increases. Our results are based on (1) a criterion for monotone optimal policies, (2) a result describing when an upper envelope of concave functions is concave, and (3) a relation between optimal Policies for the discounted and average reward criteria. Procedures for computing optimal policies are also presented. Author (GRA)

N78-10793# Rice Univ., Houston, Tex. Dept. of Electrical Engineering.
A NEW APPROACH TO STRUCTURE PRESERVING FEATURE EXTRACTION Interim Report
Scott A. Starks and Rui J. P. deFigueiredo 15 Feb. 1977 9 p refs Presented at the 1977 Conf. on Inform. Sci. and Systems, Baltimore, 30 Mar. - 1 Apr. 1977
(Grant AF-AFOSR-2777-75)
(AD-A043495; AFOSR-77-1142TR; EE-TR-7707) Avail: NTIS HC A02/MF A01 CSCL 06/4

This paper presents an approach to nonlinear feature extraction based on certain graph theoretical considerations (such as the minimal spanning tree, maximally complete subgraphs, inconsistent edges and diameter edges) and topological considerations (such as interpoint distance measures). After appropriate introductory sections, the feature extraction algorithm is developed. The algorithm is hierarchical in nature and offers considerable savings in terms of computer computation and storage requirements. An outline of the computer procedure is also included.
Author (GRA)

N78-10794# Rice Univ., Houston, Tex. Dept. of Electrical Engineering.
AN ALGORITHM FOR OPTIMAL NONLINEAR STRUCTURE PRESERVING FEATURE EXTRACTION Interim Report
Scott A. Starks and Rui J. P. deFigueiredo Jun. 1977 29 p refs Presented at the 1977 IEEE Intern. Symp. on Inform. Theory, Ithaca, N. Y., 10-14 Oct. 1977
(Grant AF-AFOSR-2777-75)
(AD-A043494; AFOSR-77-1141TR; EE-TR-7708) Avail: NTIS HC A03/MF A01 CSCL 06/4

This paper presents a new approach to nonlinear structure preserving feature extraction. This method is based on certain graph theoretical considerations (such as the minimal spanning tree, edge inconsistency, and diameter edges) and topological considerations (such as interpoint distance and measures). After introduction of the subject matter and appropriate background material, the algorithm is formulated. Numerical results from the application of this algorithm to various test data sets are presented. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N78-10795 Pittsburgh Univ., Pa.
DICHOTOMOUS VARIABLE DISCRIMINANT PROCEDURES WITH COMPLETE AND INCOMPLETE OBSERVATION VECTORS Ph.D. Thesis
Kurt Rodney Pingel 1976 160 p
Avail: Univ. Microfilms Order No. 77-15182

Dichotomous variable discriminant procedures were compared under four situations of sampling and classifying complete and incomplete observation vectors from two populations. The four procedures are: (1) independent variables (4th) procedure, (2) second order Bahadur (SB) procedure, (3) linear discriminant function procedure, and (4) quadratic discriminant function procedure. The four sampling and classifying situations have complete and complete, incomplete and complete, complete and incomplete, and incomplete and incomplete observation vectors

being sampled and then classified. The results of the study indicated that for all of the sampling and classification situations, the 4th procedure generally gave the most accurate results when the Euclidean distance squared between the mean vectors of the two populations was relatively large or if the dependence between all of the variables was relatively small. Dissert. Abstr.

N78-10796 Wisconsin Univ., Madison.
ASPECTS OF SYMBOLIC INTEGRATION AND SIMPLIFICATION OF EXPONENTIAL AND PRIMITIVE FUNCTIONS Ph.D. Thesis
Michael Rothstein 1976 127 p
Avail: Univ. Microfilms Order No. 77-8809

Some aspects are discussed of the theory necessary to obtain a canonical form for functions obtained by integration and exponentiation from the set of rational functions. These aspects include a new algorithm for symbolic integration of functions involving logarithms and exponentials which avoids factorization of polynomials in those cases where algebraic extension of the constant field is not required, avoids partial fraction decompositions, and only solves linear systems with a small number of unknowns. A theorem is found which states, roughly speaking, that if integrals which can be represented as logarithms are represented as such, the only algebraic dependence that a new exponential or logarithm can satisfy is given by the law of exponents or the law of logarithms. Dissert. Abstr.

N78-10797 Texas Univ., Arlington.
GENERALIZED STABILITY OF MOTION AND VECTOR LYAPUNOV FUNCTIONS Ph.D. Thesis
Deborah Ann Lewis Pace 1976 38 p
Avail: Univ. Microfilms Order No. 77-14422

Results on equi-stability, equi-asymptotic stability and equiboundedness are stated and proved. Since the theorems appear quite messy, corollaries are given which restate the main results in a more familiar setting. These corollaries parallel results which are already well known, and hence do not appear too surprising. However, the difficulties arise in the method of proof by contradiction since the contradiction of the vectorial inequalities is difficult to handle. Then, in order to justify the advantages of using the generalized norm, a sample theorem is stated which combines the earlier results on stability and boundedness. Extensions of traditional stability results are then achieved in a different directions; stability properties are studied relative to asymptotically self-invariant sets. A sample converse theorem is stated and then used to achieve a perturbation result. Finally, in order to see these results in a more familiar context, corollaries are stated in the case when the asymptotically self-invariant set is the usual invariant set. Dissert. Abstr.

N78-10798*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMPLIFIED CLUSTERING OF NONORTHOGONAL GRIDS GENERATED BY ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS
Reese L. Sorenson and Joseph L. Steger Aug. 1977 38 p refs
(NASA-TM-73252; A-6950) Avail: NTIS HC A03/MF A01 CSCL 12A

A simple clustering transformation is combined with the Thompson, Thames, and Mastin (TTM) method of generating computational grids to produce controlled mesh spacings. For various practical grids, the resulting hybrid scheme is easier to apply than the inhomogeneous clustering terms included in the TTM method for this purpose. The technique is illustrated in application to airfoil problems, and listings of a FORTRAN computer code for this usage are included. Author

N78-10799*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPOLATION ALGORITHMS AND IMAGE DATA ARTIFACTS
Michael L. Forman Oct. 1977 20 p refs
(NASA-TM-X-71411; X-933-77-235) Avail: NTIS HC A02/MF A01 CSCL 12A

Interpolation, or resampling coefficients, which are generated from low pass filter Fourier transforms yield more accurate resampled values than those obtained using cubic spline techniques. This is due to the utilization of six data points rather than four as currently used in cubic spline analysis. After resampling functions are applied to image data, artifacts which are similar to ringing may become pronounced. These effects are often present in the original data and the interpolation merely enhances them. Author

N78-10800# Army Concepts Analysis Agency, Bethesda, Md.
AN ANALYSIS OF VARIANCE PROGRAM FOR 2 TO THE N-TH POWER AND 3 TO THE N-THE POWER FACTORIAL EXPERIMENTS
Carl B. Bates and Jerry Thomas Jul. 1977 34 p refs
(AD-A042524; CAA-D-77-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

Modulo Analysis of Variance (MOD-ANOVA) is a computer program for 2 to the n-th power and 3 to the n-th power full or fractional factorial experiments. The program applies modular arithmetic to cell identification numbers to classify and sum the observations. MOD-ANOVA is fast and efficient and is extremely simple in structure. The complete program contains less than 130 lines of code. The program is written in FORTRAN V and is operational on the UNIVAC 1108 computer, but it should be transferable to any computer compatible with FORTRAN. GRA

N78-10801# Florida State Univ., Tallahassee. Dept. of Statistics.
SOME OPTIMAL DESIGN RESULTS IN PAIRED COMPARISONS
Ralph A. Bradley and Abdalla T. El-Helbawy May 1977 10 p refs
(Contract N00014-76-C-0608)
(AD-A042662; FSU-Statistics-M414; ONR-TR-114) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document develops the methodology for consideration of specified treatment contrasts in paired comparisons. The procedures developed give much new flexibility to the use of paired comparisons and, in particular, to the use of factorial treatment combinations in such experiments. GRA

N78-10802# Raytheon Co., Sudbury, Mass.
ERROR ANALYSIS OF PRESENTED AREA COMPUTATION TECHNIQUES Final Report, May - Dec. 1974
R. B. Smith Jun. 1977 32 p refs
(Contract F33615-73-C-0678)
(AD-A042336; ER75-4087; JTCG/AS-75-S-001) Avail: NTIS HC A03/MF A01 CSCL 12/1

Requirements of JTCG/AS test and evaluation resulted in AV (vulnerable area) data being developed for only six cardinal views. These views are defined using the positive and negative directions along the axes through the aircraft centroid. Six views are insufficient for attrition modeling purposes. For example, P001 required 26 views which must be obtained by projection of the six cardinal views. This can be accomplished using either an R(rectangular) or E(ellipsodial) projection technique. To determine the better technique, Raytheon was tasked to evaluate the relative merits of the two techniques. The scope was later expanded to include an examination of the Ap (presented area) computation techniques used in the P001, SIMFIND 2, and EVADE II attrition models. GRA

N78-10803# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
HAZARDS IN FACTOR ANALYSIS Technical Report, 1 May 1973 - 30 Apr. 1976
C. Gardner Swain, Henry E. Bryndza, and Marguerite S. Swain 15 Jul. 1977 18 p refs Submitted for publication
(Contract N00014-67-A-0204-0075; NR Proj. 051-566)
(AD-A042639; Rept-12; TR-2) Avail: NTIS HC A02/MF A01 CSCL 12/1

Principal components and other standard factor analyses can yield misleading results if an assumed subsidiary condition is untrue or if data are missing. Principal components factor analysis is tested for its reliability, using a problem with known answers. Even when test data are complete (e.g., 70 data on 7 properties, dependent on both radii and heights of 10 cylinders), such analyses followed by varimax or other standard rotations given incorrect rank orders for factors (factor scores for radius and height for each of the 10 cylinders) and sensitivities (factor loadings for

each of the 7 properties). When no data are missing, a transformation incorporating valid subsidiary conditions can be used instead of such rotations to obtain correct factors and sensitivities. However, when a moderate number (e.g., 20 or 29%) of the possible data are missing (randomly deleted), factors and sensitivities can have wrong rank orders and therefore be misleading even with this transformation. When data are missing, standard factor analysis is evidently unreliable and should be replaced by another method such as the one presented herein. Author (GRA)

N78-10804# Florida State Univ., Tallahassee. Dept. of Statistics.

MOMENT INEQUALITIES FOR Sn UNDER GENERAL DEPENDENCE RESTRICTIONS, WITH APPLICATIONS

M. Longnecker and R. J. Serfling May 1977 37 p refs
(AD-A042682; FSU-Statistics-M411; NR-TR-113) Avail: NTIS HC A03/MF A01 CSCL 12/1

Consider a sum composed of a sequence of random variables and a sequence of constants. This paper establishes moment inequalities with dependence restrictions imposed upon the random variables but not depending upon the constants. A further inequality of more complicated form is also established. The dependence restrictions considered are either of the weak multiplicative type or of related types, namely exchangeable sequences and strongly mixing sequences. Three applications are developed. One treats the almost sure convergence of series under mild dependence restrictions and finite limit conditions. Secondly, an improved technique is presented for the problem of establishing the rate of convergence in the central limit theorem for simple linear rank statistics. Finally, the central limit theorem for strongly mixing summands is treated. GRA

N78-10805# Wisconsin Univ., Madison. Mathematics Research Center.

DUAL EXTREMUM PRINCIPLES FOR NON-NEGATIVE UNSYMMETRIC OPERATORS

Ismael Herrera and Michael J. Sewell May 1977 38 p refs (Contract DAAG29-75-C-0024)
(AD-A042704; MRC-TSR-1743) Avail: NTIS HC A03/MF A01 CSCL 12/1

Dual extremum principles are constructed for non-negative unsymmetric operator equations, in terms of functional-valued operators and saddle functionals. Extremum principles for the heat equation and the wave equation are given as illustrations. Author (GRA)

N78-10806# Wisconsin Univ., Madison. Mathematics Research Center.

BLENDING INTERPOLATION SCHEMES ON TRIANGLES WITH ERROR BOUNDS

Klaus Boehmer and Gheorge Coman Apr. 1977 27 p refs (Contract DAAG29-75-C-0024)
(AD-A042705; MRC-TSR-1744) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document presents rational approximation schemes interpolating the values of a given function along two edges of a triangle and the normal derivative along the third edge. In addition, error bounds are given for these schemes. For the uniform norm, these bounds are best possible. GRA

N78-10807# Texas Univ., Austin. Dept. of Electrical Engineering.

THE STUDY OF DISTRIBUTION-FREE PERFORMANCE BOUNDS FOR NONPARAMETRIC DISCRIMINATION ALGORITHMS

T. J. Wagner 20 Jun. 1977 14 p
(Grant AF-AFOSR-2371-72)
(AD-A042685; AFOSR-77-0879TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The accomplishments of the work performed with the whole or partial support of Grant AFOSR 72-2371, 6/1/72-5/31/77, are outlined along with a listing of the publications and technical personnel supported by the grant. Author (GRA)

N78-10808# Wisconsin Univ., Madison. Mathematics Research Center.

SOME CRITICAL POINT THEOREMS AND APPLICATIONS TO SEMILINEAR ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS

Paul H. Rabinowitz Jun. 1977 18 p refs
(Contract DAAG29-75-C-0024; Contract N00014-76-C-0300)
(AD-A042732; MRC-TSR-1758) Avail: NTIS HC A02/MF A01 CSCL 12/1

Variational methods are used to obtain some new existence theorems for critical points of a real valued function on a Banach space. Applications are made to semilinear elliptic boundary value problems. Author (GRA)

N78-10809# Wisconsin Univ., Madison. Mathematics Research Center.

ON INVERSES OF VANDERMONDE AND CONFLUENT VANDERMONDE MATRICES III

Walter Gautschi Jun. 1977 10 p refs
(Contract DAAG29-75-C-0024; Grant NSF MCS-76-00842)
(AD-A042733; MRC-TSR-1759) Avail: NTIS HC A02/MF A01 CSCL 12/1

Lower bounds for the norm of the inverse Vandermonde matrix and the norm of certain inverse confluent Vandermonde matrices are derived. They supplement upper bounds which were obtained in previous papers. GRA

N78-10810# Naval Research Lab., Washington, D. C. Plasma Dynamics Branch.

EXPLICIT CHEBYCHEV-ITERATIVE SOLUTION OF NON-SELF-ADJOINT ELLIPTIC EQUATIONS ON A VECTOR COMPUTER Interim Report

B. E. McDonald Jun. 1977 48 p refs Sponsored in part by DNA
(AD-A043549; NRL-MR-3541) Avail: NTIS HC A03/MF A01 CSCL 12/1

The Chebychev explicit method can be extended to nonsymmetric matrices L whose complex eigenvalues lie with an ellipse of a particular type in the complex plane. The vectorizability of the method results in high execution efficiency on a pipeline computer. The method is derived with its convergence rate, and given a comparison with an ADI solution. The comparison is taken from a 2D plasma turbulence code. The explicit method is approximately 3 times more efficient than ADI for the model problem solved on a two-pipe ASC. The method has been used successfully on meshes of 34 x 34, 50 x 50, and 130 x 130 points. GRA

N78-10811# Naval Civil Engineering Lab., Port Hueneme, Calif.

EFFICIENCY STUDY OF IMPLICIT AND EXPLICIT TIME INTEGRATION OPERATORS FOR FINITE ELEMENT APPLICATIONS Final Report, Sep. - Nov. 1976

Michael G. Katona, Robert Thompson, and Jim Smith Jul. 1977 30 p refs
(AD-A043968; CEL-TR-856) Avail: NTIS HC A03/MF A01 CSCL 12/1

Direct integration techniques (step-by-step) are widely used for the time integration of discretized equations of motion that result from applying numerical techniques such as the finite element method to structural dynamic problems. In this study, the Newmark Beta-Method is examined for stability, accuracy, and efficiency, wherein Beta = 0 provides an explicit algorithm, while Beta - 0 provides an implicit algorithm. Both algorithms are used in the same finite element program to solve a soil-structure boundary value problem composed of a cylindrical steel sheel encased in a relatively soft rock-like material and subjected to a surface blast loading. The implicit method was significantly more efficient as measured by computer time. For nonlinear systems, the two methods were approximately equivalent in efficiency. A combined explicit-implicit integration technique is proposed that employs explicit integration in the soft material and implicit integration in the stiff material with a potential increase in efficiency by an order of magnitude over either method applied individually. Author (GRA)

N78-10812# Texas Univ., Austin. Center for Cybernetic Studies.

STRATEGY SELECTION IN ORDINAL RANKING PROBLEMS

Ronald D. Armstrong and Wade D. Cook Jul. 1977 27 p refs

(Contract N00014-75-C-0569; Grants NRC A-8966; NSF MCS-00100)
(AD-A044409; CCS-299) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper investigates a class of committee ranking problems. A given member wishes to select an ordinal ranking of a set of objects which, when combined with the rankings provided by the other members, yields a consensus ranking that is as close as possible to some desired set of preferences. Areas of potential application such as defence construction and highway planning are discussed. An algorithm for determining the best ranking together with an illustrative example is given. Author (GRA)

N78-10813# Illinois Univ., Urbana. Dept. of Computer Science.
FUTURE DEVELOPMENTS IN STIFF INTEGRATION TECHNIQUES: STABILITY OF METHODS THAT DO NOT USE AN EXACT JACOBIAN
C. W. Gear Dec. 1976 18 p refs
(Contract EY-76-S-02-2383)
(COO-2383-0035; UIUCDCS-R-76-839) Avail: NTIS HC A02/MF A01

Possible improvements that might occur through the use of very inaccurate Jacobians are examined. Such Jacobians might be chosen so that the LU decomposition is particularly simple. Some methods were shown to remain stable in spite of very large errors in the Jacobian. The results suggest that further speed increases in very large probelms are possible. ERA

N78-10814# Oak Ridge National Lab., Tenn.
SENSITIVITY THEORY FOR GENERAL NONLINEAR ALGEBRAIC EQUATIONS WITH CONSTRAINTS
E. M. Oblow Apr. 1977 17 p refs
(Contract W-7405-eng-26)
(ORNL/TM-5815) Avail: NTIS HC A02/MF A01

The general non-linear theory for algebraic equations is summarized and applied to a class of problems whose solutions are characterized by constrained extrema. Such equations form the basis of much work on energy systems modeling and the econometrics of power production and distribution. It is valuable to have a sensitivity theory available for these problem areas since it is difficult to repeatedly solve complex non-linear equations to find out the effects of alternative input assumptions or the uncertainties associated with predictions of system behavior. The sensitivity theory for a linear system of algebraic equations with constraints which can be solved using linear programming techniques is discussed. The role of the constraints in simplifying the problem so that sensitivity methodology can be applied is highlighted. The general non-linear method is summarized and applied to a non-linear programming problem in particular. Conclusions are drawn in about the applicability of the method for practical problems. ERA

N78-10319# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
INTRODUCTION TO NUMERICAL SOLUTION TECHNIQUES
Tarun Kant *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 7 p ref (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10320# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
FINITE DIFFERENCE TECHNIQUE
D. N. Buragohain, V. D. Dixit, and Tarun Kant *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 46 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A03/MF A01

N78-10321# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
NUMERICAL INTEGRATION TECHNIQUE
Tarun Kant *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 44 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10322# Indian Inst. of Tech., Bombay. Dept. of Aeronautical Engineering.
FINITE ELEMENT TECHNIQUE
K. S. R. K. Prasad *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 206 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

N78-10323# Indian Inst. of Tech., Bombay. Dept. of Civil Engineering.
A DISPLACEMENT METHOD OF ANALYSIS FOR FOLDED PLATES
N. K. Bairagi *In its* Short Term Course on Numerical Analysis of Plates and Shells 28 May 1977 21 p refs (For availability see N78-10312 01-31)
Avail: NTIS HC A22/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N78-10815 Johns Hopkins Univ., Baltimore, Md.
SMALL SAMPLE t INTERVALS FOR COMPARISONS SUGGESTED BY THE DATA Ph.D. Thesis
James Homer Godbold, Jr. 1977 130 p
Avail: Univ. Microfilms Order No. 77-14281

Interval and point estimates are provided for all pairwise differences and practically-all contrasts among equally replicated treatment means. These correspond to the Waller-Duncan k-ratio t-tests and are the full small sample extension of the large sample Dixon-Duncan k-ratio t intervals. The data consist of n treatment means x sub 1, x sub 2,... x sub n and an independent estimate s squared sub e of the error variance sigma squared sub e. The intervals derived are those which minimize the Bayes risk. In the limit as k approaches 1 these intervals shrink to zero width and provide Bayes point estimates. These intervals and point estimates provide solutions for the full range of small sample cases involving all values of n and f. The intervals obtained are shown to be narrower and generally more powerful than the corresponding conventional 100.(1 - alpha)% confidence intervals. Dissert. Abstr.

N78-10816 Illinois Univ., Urbana-Champaign.
THE EFFECTS OF MEASUREMENT ERROR ON ANALYSIS OF COVARIANCE WITH MULTIPLE COVARIATES Ph.D. Thesis
Alvin Lynn Misselt 1977 170 p
Avail: Univ. Microfilms Order No. 77-14988

Unreliably measured covariates lead to two problems in the analysis of covariance (ANCOVA). The first of these, the fact that the adjustment for pre-treatment covariate differences is incomplete, is due to measurement error bias in the regression coefficients used to compute the adjusted means. In an attempt to overcome this problem for the multiple covariate case, a modification to ANCOVA is introduced in which covariate true scores are estimated from their observed scores and their reliability coefficients. The second problem of covariate unreliability is that it inflates the denominator of the test statisic and hence reduces the probability of rejecting a false null hypothesis. In an effort to counteract this effect, an adjustment is proposed which substitutes estimates pf true-score quantities in place of their observed-score counterparts in the ANCOVA error term.
Dissert. Abstr.

N78-10817 Columbia Univ., New York.
CONTRIBUTION TO THE THEORY OF EMBEDDABILITY AND INDENTIFICATION FOR MARKOV AND SOME MARKOV RELATED PROCESSES Ph.D. Thesis
France-Helene Switalski 1977 177 p
Avail: Univ. Microfilms Order No. 77-15296

A stochastic matrix, transition matrix of an unknown stochastic process having a finite number of states is observed. Necessary and sufficient conditions are found for this matrix to be embeddable into each of the models considered. Explicit solutions to the inverse problem are found in the two-dimensional case. Neces-

sary (but not sufficient) conditions together with bounds for the parameters of the model involved are found in the higher-dimensional cases. Examples are given. Dissert. Abstr.

N78-10818 Wisconsin Univ., Madison.
CHARACTERIZATION OF STOCHASTIC SURFACE GEOMETRY WITH APPLICATIONS Ph.D. Thesis
Farrokh Nassirpour-Oskoui 1976 313 p
Avail: Univ. Microfilms Order No. 77-8107

A procedure is developed to characterize an anisotropic surface from five surface profiles in five arbitrary directions. Explicit expressions are given for calculating three-dimensional surface spectral moments from five sets of profile spectral moments. The computed values of the abrasive surface characteristics show that there exists a principal direction along which the coated abrasive may exhibit its best cutting properties. The characterization of isotropic surfaces and an application to grinding wheel topography is given. The approach leads to a method for checking surface isotropy and finding the number of active cutting edges per unit area on grinding wheel surfaces. The characterization of surface profile geometry is developed. The influence of feed rate, nose radius, and cutting speed on the turned surface geometry is determined and response surface contours are constructed. A technique for reconstructing the surface geometry through the use of a computer and the parameters of the stochastic differential equation is developed and examples are given.
Dissert. Abstr.

N78-10819# Wisconsin Univ., Madison. Mathematics Research Center.
AN ALGORITHM FOR THE DISCRETE FISHER'S PERMUTATION TEST
Andrew P. Soms Apr. 1977 12 p refs
(Contract DAAG29-75-C-0024)
(AD-A042706; MRC-TSR-1745) Avail: NTIS HC A02/MF A01 CSCL 12/1

An algorithm, especially suitable for a computer, is presented for carrying out Fisher's two-sample permutation test for non-negative integer-valued data. It is shown that the same method can be applied to carry out the permutation Wilcoxon test, using average ranks. Some numerical examples are given and an optimal property of the permutation test is indicated.
Author (GRA)

N78-10820# California Univ., Davis. Dept. of Mathematics.
A GENERALIZATION OF A THEOREM BY BOSWELL AND PATIL Interim Report
Gail G. Hannon and Francisco J. Samaniego Jun. 1977 15 p refs
(Grant AF-AFOSR-3180-77)
(AD-A042160; TR-2; AFOSR-77-0804TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The class of convoluted Pascal distributions obeying certain moment conditions are characterized by a system of differential equations satisfied by their probability mass functions. The result contains a characterization of Pascal distributions obtained by Boswell and Patil (1973) as a special case. Author (GRA)

N78-10821# Michigan Univ., Ann Arbor. Dept. of Industrial and Operations Engineering.
ON POISSON TRAFFIC PROCESSES IN DISCRETE STATE MARKOVIAN SYSTEMS WITH APPLICATIONS TO QUEUEING THEORY
Benjamin Melamed Jul. 1977 47 p refs
(Contract N00014-75-C-0492; Grants AF-AFOSR-2903-16; NSF ENG-75-20223; NR Proj. 042-296)
(AD-A043528; TR-77-7) Avail: NTIS HC A03/MF A01 CSCL 12/1

A regular Markov process is considered with continuous parameter, countable state space, and stationary transition probabilities, over which a class of traffic processes is defined. The feasibility that multiple traffic processes constitute mutually independent Poisson processes is investigated in some detail. A variety of independence conditions on the traffic process and the underlying Markov process are shown to be equivalent or sufficient to ensure Poisson related properties; these conditions include independent increments, renewal, weak pointwise independence, and pointwise independence. Two computational criteria for Poisson traffic are developed: a necessary condition in terms of weak pointwise independence, and a sufficient condition in terms of pointwise independence. The utility of these criteria is demonstrated by sample applications to queueing-theoretic models. It follows that, for the class of traffic processes as per this paper in a queueing-theoretic context, Kelly's notion of quasi-reversibility and Gelenbe and Muntz's notion of completeness are essentially equivalent to pointwise independence of traffic and state. The latter concept, however, is the most general one. The relevance of the theory developed to queueing network decomposition is also pointed out. GRA

N78-10822# Los Alamos Scientific Lab., N. Mex.
VARIANCES AND COVARIANCES OF THE NORMAL ORDER STATISTICS FOR SAMPLE SIZES 2 TO 50
G. L. Tietjen, D. K. Kahaner, and R. J. Beckman Aug. 1976 74 p refs
(Contract W-7405-eng-36)
(LA-6482-MS) Avail: NTIS HC A04/MF A01

Tables of the variances and covariances of the normal order statistics for samples of size N less than or equal to 20 were given by Sarhan and Greenberg (1956), based on tables of expected values given by Teichroew (1956). These results are extended to N less than or equal to 50. ERA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N78-10823 Brown Univ., Providence, R. I.
INFINITE-TIME REGULATOR FOR A CLASS OF FUNCTIONAL DIFFERENTIAL SYSTEMS AND A MINIMUM CONTROL ENERGY PROBLEM FOR ORDINARY DIFFERENTIAL SYSTEMS Ph.D. Thesis
Wook Hyun Kwon 1976 118 p
Avail: Univ. Microfilms Order No. 77-14151

Using existing theorems from Lyapunov's direct method in the space of continuous functions, it is shown that the bounded closed-loop solution of the optimal system is asymptotically stable if the system is stabilizable and detectable. It is shown that all poles of the closed-loop system can be located to the left of any vertical line in the complex plane by introducing a certain factor in the cost function if the system is controllable. An integrated controllability Gramian matrix is introduced and a feedback control law employing this matrix is shown to stabilize a linear system and allow almost all time-varying gains or nonlinearities in the closed loop without destroying asymptotic stability. In a related class of problems an autonomous closed-loop control of the minimum control energy problem with an average-power constraint is defined and shown to stabilize the system in terms of finite-time stability. Dissert. Abstr.

N78-10824*# California Univ., Berkeley.
AVOIDANCE CONTROL
G. Leitmann and J. Skowronski (Queensland Univ., Brisbane, Australia) Jun. 1977 18 p
(Contract NsG-2242)
(NASA-CR-152042) Avail: NTIS HC A02/MF A01 CSCL 12B

Dynamical systems were considered, subject to control by two agents, one of whom desires that no trajectory of the system, emanating from outside a given set, intersects the set no matter what the admissible actions of the other agent. Conditions are given whose satisfaction assures that a given control results in avoidance. Furthermore, these conditions are constructive in that they yield an avoidance feedback control. Some examples are presented. Author

N78-10825*# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
QUALITATIVE DIFFERENTIAL GAMES WITH TWO TARGETS
W. M. Getz and G. Leitmann (Calif. Univ., Berkeley) Aug. 1977 19 p refs
(Contract NsG-2242)

(NASA-CR-152044) Avail: NTIS HC A02/MF A01 CSCL 12B

So-called differential games of kind (qualitative games) were considered involving two or more players each of whom possesses a target toward which he wished to steer the response of a dynamical system that was under the control of all players. Sufficient conditions were derived, which assure termination on a particular player's target. In general, these conditions were constructive in that they permited construction of a winning (terminating) strategy for a player. The theory is illustrated by a pursuit-evasion problem. Author

N78-10826# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Statistics.
APPROXIMATE MODELS FOR CENTRAL SERVER SYSTEMS WITH TWO JOB TYPES
John P. Lehoczky and Donald P. Gaver (Naval Postgraduate School) Jun. 1977 28 p refs
(Grant AF-AFOSR-2642-74)
(AD-A042684; TR-130) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two new approximation techniques for describing the performance of a closed queueing network when two or more job types are present are introduced and analyzed. The approximations apply in cases where a product form steady state solution can not be obtained, for example in the first-come-first served single server queue case. This approximation provides a method of reducing the state space to a small fraction of that needed for an implementation of the Gaver-Humfeld method. Numerical results illustrate the excellent accuracy of these techniques.
Author (GRA)

N78-10827# Center for Naval Analyses, Arlington, Va.
NOMOGRAPHY FOR OPERATIONS RESEARCH
Russell C. Coile 12 Apr. 1977 41 p refs Presented at Joint Natl. Meeting of the Operations Res. Soc. of Am. and the Inst. for Management Services, San Francisco, 9 May 1977
(AD-A043620; CNA-PP-187) Avail: NTIS HC A03/MF A01 CSCL 12/2

Nomographs have been found to be useful in operations research. These charts for graphical computation have the advantages to the user of being non-electronic, quick, and easy to use. They can be designed to present complicated mathematical formulas in a simple format to non-mathematical people. Disadvantages are the slide-rule type accuracy and the possible lack of feel that families of curves might possibly give. Research on applications of nomographs in solving operations research problems has lead to development of some procedures for simplified design of nomographs. Examples of nomographs for acoustical design, radar, and sonar illustrate these procedures.
Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N78-10828 Massachusetts Univ., Amherst.
APPLICATIONS OF TOPOLOGICAL VECTOR SPACES LINEAR SYSTEM THEORY Ph.D. Thesis
Stephen Jones Hegner 1977 151 p
Avail: Univ. Microfilms Order No. 77-13820

A duality for discrete-time linear systems, and an approach to continuous-time linear systems are presented. Previously duality theories for discrete-time linear systems over a field K were restricted to those cases in which the input, state, and output spaces are finite-dimensional. Direct attempts to extend such a theory to infinite-dimensional systems fail, because the category of linear spaces over the field K is not self-dual and, hence, does not, by itself, provide an adequate framework for a general duality theory of discrete linear systems. Instead, it is necessary to consider categories of linearly-topologized spaces over K, and to use topological rather than algebraic duals. Using this approach, the dimensionality of the system is of no consequence, and so finite- and infinite-dimensional systems are handled with equal ease. Dissert. Abstr.

N78-10829 Wisconsin Univ., Madison.
TIME SERIES: ESTIMATION, SMOOTHING AND SEASONAL ADJUSTMENT Ph.D. Thesis
Steven Craig Hillmer 1976 127 p
Avail: Univ. Microfilms Order No. 77-8094

Two problems are considered. The first problem is that of estimating multivariate ARIMA time series models. It is assumed that the shocks driving the time series are normally distributed. Given observed values of a time series and candidate values for the parameters, a method for calculating the likelihood function is derived. The second problem considered is that of either smoothing or seasonally adjusting a univariate time series. It is assumed that a time series follows an ARIMA univariate time series model and that the series is the sum of a signal plus noise. Methods are derived to smooth the time series which are consistent with the observed model. Next, seasonal adjustment is considered. The observed time series is assumed to be the sum of a seasonal component and a trend component and an error component. Dissert. Abstr.

N78-10830 Brown Univ., Providence, R. I.
STAR-SHAPED REGIONS OF STABILITY IN HEREDITARY SYSTEMS Ph.D. Thesis
Richard Andrew Silkowski 1976 48 p
Avail: Univ. Microfilms Order No. 77-14190

For the linear difference equation it is shown that regions of stability are not star-shaped in general. However, for difference equations where the delay parameters are fixed but known only up to arbitrarily small neighborhoods it is shown that the region which guarantees stability is star-shaped. This stability in the delay parameters is characterized in terms of the matrix coefficients of the equation. This characterization is much stronger in general than that required for stability with fixed and known delays. However, it is shown that stability for any fixed set of irrational time delays is equivalent to stability for every fixed set of time delays. An example of this characterization of stability in the delays is given. Dissert. Abstr.

N78-10831 Wisconsin Univ., Madison.
HOMOTOPY PROPERTIES OF DECOMPOSITION SPACES Ph.D. Thesis
Neelima Mohan Shrinkhande 1976 83 p
Avail: Univ. Microfilms Order No. 77-8813

Let X be a continuum in E to the nth power. A study is done of the local and global homotopy properties of the decomposition space E to the nth power mod X obtained by collapsing X to a point and giving it the identification topology. The homotopy type of the decomposition space depends only on the shape of X as defined by K. Continua are characterized for which E to the nth power mod X is locally simply connected. These are the nearly 1-movable continua as defined by McMillan. Since near 1-movability of X is preserved by fundamental domination, the result obtained is that the 1-LC property of E to the nth power mod X also depends only on the shape X. A condition N is defined which is a necessary condition for E to the nth power and mod X to be simply connected. This is also a necessary condition for X to be archwise connected, or to be nearly 1-movable. Dissert. Abstr.

N78-10832 Rensselaer Polytechnic Inst., Troy, N. Y.
BEST SIMULTANEOUS APPROXIMATION IN A NORMED LINEAR SPACE Ph.D. Thesis
Dean Charles Nairn 1976 120 p
Avail: Univ. Microfilms Order No. 77-13714

The problem considered is the approximation of m elements in a normed linear space by one element in a subset of that normed linear space. To each element in the ordered m-tuple corresponding continuous seminorms are associated. Then using these seminorms to measure the closeness x sub 0 has to each (x sub 1,...,x sub m) errors are derived. A best simultaneous approximation to (x sub 1,...,x sub 0) is the x sub 0 which minimizes a prescribed combination of the errors E sub 1, ..., E sub m. The main results found are existence and characterization theorems which generalize well known functional analytical theorems from the theory of best approximation in a normed linear space. When the approximations are from a finite dimensional space a generalization of Singer's theorem is obtained using the extreme elements of the unit ball. Dissert. Abstr.

N78-10833*# California Univ., Berkeley.
EVASION IN THE PLANE
G. Leitmann and H. S. Liu Jul. 1977 13 p refs
(Grant NsG-2242)
(NASA-CR-152043) Avail: NTIS HC A02/MF A01 CSCL 12A

Dynamic systems were considered subject to control by two agents, one of whom desires that no trajectory of the system emanating from outside a given set, intersects that set no matter what the admissible actions of the other agent. Constructive conditions sufficient to yield a feedback control for the agent seeking avoidance were employed to deduce an evader control for the planar pursuit-evasion problem with bounded normal accelerations. Author

N78-10834# Rochester Univ., N. Y. Dept. of Computer Science.
ON THE n(log2n) ISOMORPHISM TECHNIQUE
Gary L. Miller Mar. 1977 10 p refs
(Contract N00014-75-C-1091; Grant NRC A-5549)
(AD-A044439; TR-17) Avail: NTIS HC A02/MF A01 CSCL 12/1

An algorithm is given for deciding isomorphism of two groups of order n (given as multiplication tables) which runs in O(n to the (log sub 2 n - O(1)) power) steps where n is the order of the groups. The fact that a group of n is generated by log n element is used. This technique generalizes to isomorphism of quasigroups, latin squares, and some graphs generated from latin squares. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N78-10835 Boston Coll., Chestnut Hill, Mass.
FLASH PHOTOLYSIS STUDIES OF THE RECOMBINATION OF HALIDE ATOMS Ph.D. Thesis
Peter John Papaglannakopoulos 1977 225 p
Avail: Univ. Microfilms Order No. 77-15150

A flash photolysis apparatus was constructed which uses a coaxial flashlamp. Using the apparatus in the kinetic mode of operation, the recombination rate constants of iodine atoms in the presence of argon were measured at room temperature and found to be k sub Ar = (24 + or - 1) x 10 to the 8th power (sq M x sec), and k sub I2 = (140 + or - 20) x 10 to the 10th power per (sq M x sec). Flash photolysis experiments were then performed on chlorine diluted with argon, over a wide range of rations [Cl2/]. In the regions of [Cl2/] [Ar] less than .05, the combination rate constant k sub Ar at room temperature was found to be k sub Ar = (5.8 + or - 1.4) x 10 to the 9th power per (sq M x sec). In the region of [Cl2] [Ar] greater than .05, the measured value is k sub Ar = (5.0 + or - 0.7) x 10 to the 9th power per (sq M x sec). In an experiment using a pure chlorine sample, k sub Cl2 at 446 k was found to be k sub Cl2 = 23 x 10 to the 9th power per (sq M x sec).
Dissert. Abstr.

N78-10836# Naval Research Lab., Washington, D. C.
DIFFUSION OF MAGNETIC FLUX INTO A CYLINDRICAL LINER IN THE LIMIT OF HIGH MAGNETIC REYNOLDS NUMBER Memorandum Report
A. L. Cooper and D. L. Book May 1977 49 p refs
(AD-A042162; NRL-MR-3507) Avail: NTIS HC A03/MF A01 CSCL 20/3

Calculations have been made of the rate at which confined magnetic flux compressed by an imploding cylindrical liner diffuses into the latter because of finite electrical resistivity. The diffused magnetic field profile and associated magnetic energy and Joule heating are also calculated. In the limit of high magnetic Reynolds number Rm, the skin depth, total diffused flux and associated energy scale like 1/(square root of Rm). It is shown that cylindrical liner motion mitigates the diffusion calculated in slab models, owing to the reduction in the surface area through which the flux must diffuse. The influence of the form of the liner trajectory on the results is displayed. GRA

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N78-10837* National Aeronautics and Space Administration. Pasadena Office, Calif.
ACOUSTIC ENERGY SHAPING Patent
Taylor G. Wang (JPL) and Daniel D. Elleman, inventors (to NASA) (JPL) Issued 4 Oct. 1977 5 p Filed 13 Feb. 1976 Supersedes N76-18886 (14 - 09, p 1182) Sponsored by NASA
(NASA-Case-NPO-13802-1; US-Patent-4,052,181; US-Patent-Appl-SN-658133; US-Patent-Class-65-2; US-Patent-Class-65-32; US-Patent-Class-65-87; US-Patent-Class-65-102; US-Patent-Class-65-DIG.4; US-Patent-Class-65-DIG.7; US-Patent-Class-65-48; US-Patent-Class-73-505; US-Patent-Class-264-23; US-Patent-Class-264-345) Avail: US Patent Office CSCL 20A

A suspended mass is shaped by melting all or a selected portion of the mass and applying acoustic energy in varying amounts to different portions of the mass. In one technique for forming an optical waveguide slug, a mass of oval section is suspended and only a portion along the middle of the cross-section is heated to a largely fluid consistency. Acoustic energy is applied to opposite edges of the oval mass to press the unheated opposite edge portions together so as to form bulges at the middle of the mass. In another technique for forming a ribbon of silicon for constructing solar cells, a cylindrical thread of silicon is drawn from a molten mass of silicon, and acoustic energy is applied to opposite sides of the molten thread to flatten it into a ribbon. Official Gazette of the U.S. Patent Office

N78-10838 California Univ., San Diego.
NEAR-BOTTOM OBSERVATIONS OF SEA-FLOOR ACOUSTICS Ph.D. Thesis
Robert Charles Tyce 1977 246 p
Avail: Univ. Microfilms Order No. 77-13696

A system for quantitative near-bottom seismic profiling at 4 kHz was developed in order to observe small scale horizontal variations in acoustic reflectivity of the sea floor as well as similar properties for shallow, layered structures in bottom sediments. The system provides real time computer processing and quantitative displays of processed data in several forms. These quantitative displays provide a real-time capability for mapping reflectivity of the seafloor and subbottom reflectors within a survey area, and for estimating acoustic attenuation in marine sediments from observations of layer reflectivity as a function of depth of burial. Dissert. Abstr.

N78-10839*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CONCORDE NOISE-INDUCED BUILDING VIBRATIONS: INTERNATIONAL AIRPORT DULLES Final Report
W. H. Mayes, H. F. Scholl, D. G. Stephens, B. G. Holliday, R. DeLoach, T. D. Finley, H. K. Holmes, R. B. Lewis, and J. W. Lynch Sep. 1977 19 p
(NASA-TM-74083) Avail: NTIS HC A02/MF A01 CSCL 20A

A series of studies were conducted to assess the noise-induced building vibrations associated with Concorde operations. The vibration levels of windows, walls, and floors were measured along with the associated noise levels of Concorde, subsonic aircraft and some nonaircraft events. Test sites included Sully Plantation which is adjacent to Dulles International Airport and three residential homes located in Montgomery County, Maryland. The measured vibration response levels due to Concorde operations were found to be: (1) higher than the levels due to other aircraft, (2) less than the levels due to certain household events which involve direct impulsive loading such as door and window closing, (3) less than criteria levels for building damage, and (4) comparable to levels which are perceptible to people.
Author

N78-10840# Pennsylvania State Univ., University Park. Applied Research Lab.
A STUDY OF PSYCHOACOUSTICS IN PASSIVE SONAR

CLASSIFICATION. PART 2: A REVIEW OF GENERAL CONCEPTS AND A DISCUSSION OF RESULTS OBTAINED TO DATE

Claus P. Janota 28 May 1975 81 p refs
(Contract N00017-73-C-1418)
(AD-A042635; TM-75-165-Pt-2) Avail: NTIS HC A05/MF A01 CSCL 17/1

This report reviews relevant knowledge in the context of passive sonar aural recognition of a noise source, and defines an experimental approach to extend the state of knowledge in areas of immediate concern to the Naval Air Systems Command. The report is prepared in two parts with Part 1 summarizing the sonar classification task and then leading into the relationships of this task to the general topic of acoustic warfare. Part 2 of the report considers the aural classification task in more general terms. The results of studies using trained listeners are presented and are compared to those predicted from previous studies done elsewhere. A model of the classification task as a specialized detection problem is presented and it is shown that the model allows prediction of the results within a few dB of signal-to-noise ratio required to make a terminal classification decision.

Author (GRA)

N78-10841# Stanford Univ., Calif. Edward L. Ginzton Lab.
STUDY OF NONLINEAR ACOUSTICS FOR THE PURPOSE OF PROCESSING SOPHISTICATED SIGNALS Final Report, 1 Jan. 1974 - 28 Feb. 1977

C. F. Quate and H. J. Shaw 1 Jun. 1977 23 p refs
(Grant DAHC04-74-G-0093)
(AD-A042509; ARO-12121.2-EL) Avail: NTIS HC A02/MF A01 CSCL 17/1

The work consists of two projects - one on the digital control of acoustic signals from an imaging array and the second on the use of acoustic signals to interrogate thermal images formed on an array of silicon bolometers. In the first project it has been shown that in contrast to the present systems where analog systems are used to control the arrays in acoustic imaging multilevel digital processing systems can be employed to provide for the scanning and focusing of these arrays. The net result is an increase in performance and flexibility of these systems with images in real time. In the second part of the program we have shown that propagating acoustic signals can be used to interrogate an array of silicon bolometers which contain a thermal image. The theoretical and experimental results comprise a foundation for the construction of the thermal imaging device of the type described. The device should outperform existing uncooled thermal imaging devices over a practical range of frequencies.

Author (GRA)

N78-10842# Pennsylvania State Univ., University Park. Applied Research Lab.
SOUND TRANSMISSION IN THE 48-INCH WATER TUNNEL FOR A RANGE OF TOTAL AIR CONTENT, PRESSURE, AND VELOCITY

D. E. Thompson 18 May 1977 13 p refs
(Contract N00017-73-C-1418)
(AD-A042814; TM-77-175) Avail: NTIS HC A02/MF A01 CSCL 20/1

It is well known that the presence of small bubbles in water can cause attenuation of transmitted sound. An experiment was performed in the 48-inch diameter water tunnel test section to determine the effects of total air content, test section pressure, and velocity on the transmission of sound. It was shown that there is negligible attenuation of sound for typical ranges of the variables considered.

Author (GRA)

N78-10843# Tracor Sciences and Systems, Austin, Tex.
PRELIMINARY DESIGN OF AN AIRCRAFT NOISE MEASUREMENT SYSTEM FOR CERTIFICATION AND RESEARCH, TASK B Final Report, Sep. 1976 - Dec. 1977

B. K. Cooper Jan. 1977 235 p refs
(Contract DOT-FATQWA-3900)
(AD-A042798/9; T75-AU-9531U; FAA-RD-75-217) Avail: NTIS HC A11/MF A01 CSCL 01/3

System requirements are presented for a noise measurement system capable of performing tests conforming to FAR Part 36 and for a research noise measurement system applicable to a broad range of objectives. The characteristics of subsystems for the functions of acoustical data collection, aircraft tracking, weather data collection, aircraft performance data collection, and data processing are discussed. Alternative subsytems representative of a range of performance capabilities and costs are considered in terms of specific measurement objectives and other factors. Example system configurations for both certification and research applications are described. The study emphasizes conceptual design rather than detailed equipment/system specifications.

Author

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N78-10844 Rensselaer Polytechnic Inst., Troy, N. Y.
NEGATIVE MESON CAPTURE IN HYDROGEN Ph.D. Thesis

Thomas John Baird 1976 237 p
Avail: Univ. Microfilms Order No. 77-13702

The cross section for ionization for capture of the incident particle was calculated for relative kinetic energies greater than 1.0 Rydberg. Since ionization was found to occur with the emission of electrons of nearly zero kinetic energy, the fraction of ionizing collisions which results in capture decreases very rapidly with projectile kinetic energy. The energy distributions of slowed down muons and hadrons were also computed. These distributions were used together with the capture cross section to determine the distribution of kinetic energies at which capture takes place. It was found that most captures occur for kinetic energies slightly less than 1.0 Rydbergs with relatively little capture at thermal energies. The captured particles therefore tend to go into very large and loosely found orbits with binding energies less than 0.1 Rydbergs.

Dissert. Abstr.

N78-10845 Pittsburgh Univ., Pa.
AN INVESTIGATION OF THE METASTABLE SPECIES RESULTING FROM DISSOCIATIVE EXCITATION OF SEVERAL HYDROGEN BEARING MOLECULES Ph.D. Thesis

Byron Lee Carnahan 1976 260 p
Avail: Univ. Microfilms Order No. 77-15242

The production of long lived, electronically excited or metastable species through dissociative excitation induced by electron bombardment of several molecular gases has been investigated using the techniques of translational spectroscopy. Those gases studied included two polyatomic hydrogen bearing molecules, CH4 and NH3, and the isotopic forms of the hydrogen molecule H2, HD and D2. For CH4 and NH3 an extensive set of measurements revealed that a group of high velocity metastable hydrogen atoms result from the excitation of both gases through a number of dissociation channels, a total of five for methane and four for ammonia. The H2 -HD -D2 system was investigated to determine the effect of variation in the molecular mass on the dissociative excitation process. Time-of-flight spectra of the metastable products resulting from these gases revealed that a fast and slow group of metastable atomic fragments were produced in each case.

Dissert. Abstr.

N78-10846 Brown Univ., Providence, R. I.
LOW ENERGY ELECTRON-HYDROGEN ION AS A TEST OF THE INHOMOGENEOUS EQUATION METHOD Ph.D. Thesis

Paul William Dahlgren, Jr. 1976 87 p
Avail: Univ. Microfilms Order No. 77-14107

Calculations of low energy electron-hydrogen scattering were performed to determine the usefulness of the inhomogeneous equation method in approximate form. The Schrodinger equation for the full scattering wave function psi was placed by an inhomogeneous equation for an auxiliary function xi. For the electron-hydrogen system, psi must be antisymmetric under exchange of space and spin coordinates for the two electrons. Expansion of the spatial part of psi must be either symmetric or antisymmetric depending on the symmetry property of the total spin state. Use of xi permits an expansion which does not

display explicit symmetry properties. The solution to the equation is a sum of the complementary function and the particular integral, subject to the boundary conditions imposed. Dissert. Abstr.

N78-10847 Columbia Univ., New York.
FINE STRUCTURE AND HYPERFINE STRUCTURE MEASUREMENTS IN EXCITED STATES OF ALKALI ATOMS BY DYE LASER SPECTROSCOPY Ph.D. Thesis
John William Farley 1977 96 p
Avail: Univ. Microfilms Order No. 77-14795

The fine structure interval of the Rb 6F state and the hyperfine structure coupling constants of the Cs133, 15S sub 1/2, 16S sub 1/2, 17S sub 1/2, and 10P sub 1/2 states were measured using radiofrequency spectroscopy. A stepwise excitation scheme, using a conventional resonance lamp in conjunction with a tunable CW dye laser, was used to reach these exotic states. The precision of the Rb measurement is nearly two orders of magnitude better than previous measurements. The Cs states were measured for the first time. The precision of the measurements considerably exceeds the accuracy of theoretical calculations. Dissert. Abstr.

N78-10848 Pittsburgh Univ., Pa.
MONTE CARLO SIMULATION OF THE ION MOTION IN DRIFT TUBES Ph.D. Thesis
Sheng Ling Lin 1976 110 p
Avail: Univ. Microfilms Order No. 77-15237

The stochastic process of ion motion in drift tubes under the influence of an external electric field is studied. The extended null-collision method is introduced in Monte Carlo simulation to speed up simulation procedures and therefore to reduce statistical fluctuations. The obtained speed distribution functions are used to analyze the reaction rate data. The close agreement between the predicted reaction rate and the experiment results sufficiently explains the necessity of the present calculations. The mobilities of the He(+) in He and Ne(+) in Ne, for which case the resonant charge transfer is important, have also been simulated on computer. Dissert. Abstr.

N78-10849 Arizona Univ., Tucson.
THEORETICAL STUDY OF INELASTIC ION-ATOM COLLISIONS Ph.D. Thesis
Gary Bruno Schmid 1977 102 p
Avail: Univ. Microfilms Order No. 77-15341

Transformation theory is used to show that unique semiclassical atomic scattering states which obey the asymptotic conditions of formal scattering theory, can be derived by transforming non-travelling atomic states, i.e., states whose coordinate variables are referred to a stationary origin, to frames at rest with respect to the incoming or outgoing particles. An overview of the problem of properly defining such scattering states is presented. The operator which carries out the necessary transformation from inertial to non-inertial frames is derived and its properties are discussed. The relation of this transformation operator to the translation factor discussed in the literature is presented. The application of this operator to transform the time-dependent Schrodinger equation from an inertial to a non-inertial frame is presented and the implications of these new terms to scattering problems are discussed. Dissert. Abstr.

N78-10850 Rensselaer Polytechnic Inst., Troy, N. Y.
APPLICATION OF AN ACOUSTIC TRANSDUCER FOR THE DETECTION OF LOW ENERGY NEUTRAL ATOMIC BEAMS Ph.D. Thesis
Gerald Paul Szatkowski 1976 102 p
Avail: Univ. Microfilms Order No. 77-13709

A technique for monitoring low energy neutral particle beams has been investigated by the application of classical momentum transfer theory to an acoustic transducer. The experiment allowed for a spatially modulated sodium ion beam, mass and energy resolved, to be pulsed onto a condenser type transducer. A beam monitor enabled the determination of the ion flux and the calibration of the detected signal to the total momentum transfer occurring during a single pulse. Measurements taken for 12 kV, 14 kV, and 16 kV ions, and plotted according to the log of the total pulsed momentum vs the log of the detector output signal, demonstrated significant linear correlation and good agreement with the sensitivity curve of the transducer-amplifier. Dissert. Abstr.

N78-10851# California Inst. of Tech., Pasadena.
PICOSECOND RADIATIONLESS TRANSITIONS IN POLYATOMIC MOLECULES Final Report
G. Wilse Robinson 19 May 1977 13 p refs
(Contract DAHC04-74-C-0010)
(AD-A042109; ARO-11783.8-C) Avail: NTIS HC A02/MF A01 CSCL 07/4

Radiationless transitions concern the way energy is stored, exchanged and utilized in chemical systems. It is therefore a more important area of study than the radiative transitions which accompany them. The main thrust of the research was to modernize the theory of radiationless transitions in polyatomic molecules, and to utilize the intuition gained for suggesting interesting picosecond experiments dealing with energy exchange and other types of radiationless processes. GRA

N78-10852# Naval Research Lab., Washington, D. C.
A BOLTZMANN TRANSPORT CODE FOR ION PENETRATION IN MATTER
G. P. Mueller and Mervine Rosen Jul. 1977 49 p refs
(RR0221141)
(AD-A043502; NRL-MR-3556) Avail: NTIS HC A03/MF A01 CSCL 20/8

The Boltzmann equation for the single particle distribution function for a heavy ion beam penetrating matter is solved. Assume rotational and translational invariance, plane symmetry and time independence. A Hermite and Legendre polynomial expansion of the distribution function is made in the configuration and angular coordinates, respectively. A code for numerically solving the integral equations for the energy dependent expansion coefficients has been written and solved explicitly for the case of monoenergetic 200 keV beam of antimony ions incident on germanium. The range distribution of stopped Sb ions and the distribution of energy loss from the beam are presented. GRA

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N78-10853 Yale Univ., New Haven, Conn.
THE POLARIZATION OF THE NEUTRONS PRODUCED BY THE PHOTO-DISINTEGRATION OF DEUTERIUM Ph.D. Thesis
Lawrence Joel Drooks 1976 139 p
Avail: Univ. Microfilms Order No. 77-14036

Neutron polarization is measured by observing the asymmetry in the elastic scattering from a carbon cylinder whose analyzing power is determined absolutely in a separate double scattering experiment. A spin precession solenoid is used to eliminate false asymmetries. Neutron energies are measured with a nanosecond time-of-flight spectometer. The extent of neutron depolarization due to multiple scattering of the polarized neutrons in the liquid deuterium target is determined by means of a Monte Carlo calculation, and the experimental results corrected accordingly. Results are in reasonable agreement with calculations of deuteron photo-disintegration which both include and exclude effects of meson exchange currents, but with a definite preference, observed at three reaction angles, for the calculation which includes meson effects. Dissert. Abstr.

N78-10854 New Mexico State Univ., University Park.
A STUDY OF THE LAMBDA BINDING ENERGY IN NUCLEAR MATTER Ph.D. Thesis
Jimmy Durwood Shirley 1977 145 p
Avail: Univ. Microfilms Order No. 77-14313

The Brueckner-Goldstone theory of nuclear matter is applied to the problem of calculating the binding energy D of a lambda hyperon particle in nuclear matter. Two methods, the independent pair approximation and the reference spectrum method, of

calculating D are studied and compared in detail. It is found that there are only minor differences between the two methods. Then s-wave energy dependent equivalent potentials which reproduce the experiment lambda hyperon -p total scattering cross sections are used in the framework of the IPA method to estimate the binding energy of a lambda hyperon particle in nuclear matter. It is found that the value of the lambda hyperon binding energy thus obtained is consistent with the lambda hyperon binding energy computed in all partial waves with a potential which is suppressed by 50-70 percent in p-wave.
Dissert. Abstr.

N78-10855 Wisconsin Univ., Madison.
THE ISOSPIN FORBIDDEN AND ALLOWED REACTIONS O-16(ALPHA, ALPHA 0)O-16 AND O-16(ALPHA, GAMMA I)Ne-20 Ph.D. Thesis
Daniel John Steck 1976 202 p
Avail: Univ. Microfilms Order No. 77-8120

Differential cross sections have been measured for the radiative capture and elastic scattering of alpha particles on O-16 for incident beam energies between 6.9 and 10.15 MeV. Narrow resonant structures, found in a radiative capture survey that employed a 60 keV thick target and Ge(Li) detectors to observe the gamma decays to the ground and first two excited states, were investigated in further detail. Near each of the eight structures, excitation functions were taken simultaneously of both the radiative capture at 90 deg and the elastic scattering at 14 angles. In addition, an array of NaI crystals measured the on and off resonance angular distributions of the gamma decay at 3 to 7 angles. The results from both reactions have been combined to establish a consistent set of parameters for the compound nuclear, Ne-20, levels. Generally, the results of this work are compatible with previous observations. Analysis of the isospin purity of the T = 1 levels shows that the strength of the mixing force is well within the capabilities of the Coulomb interaction.
Dissert. Abstr.

N78-10856 Pittsburgh Univ., Pa.
A NUCLEAR MAGNETIC RESONANCE STUDY OF FLUORIDE ION MOTION IN LEAD FLUORIDE Ph.D. Thesis
Tzong Yang Hwang 1976 104 p
Avail: Univ. Microfilms Order No. 77-15260

The high diffusivity of fluoride ions was studied by pulsed NMR techniques. On both pure crystal and NaF doped samples of PbFe spin-lattice relaxation time (T/sub1), spin-spin relaxation time (T/sub2), and spin-lattice relaxation time in the rotating frame (T/sub1) were measured as a function of temperature. The measurements yielded several different activation energies which were compared to the results of conductivity measurements. T sub 1 as a T sub 2 measurements were also made on a doped sample as a function of pressure. The measuring frequency dependence of T sub 1 was examined. Evidence shows that T sub 1 and T sub 2 relaxations in NaF doped PbF2 are due to different mechanisms. A relaxation mechanism different from motional modulation of dipolar interaction is proposed for T sub 1 relaxation. Dissert. Abstr.

N78-10857 Pittsburgh Univ., Pa.
INCLUSIVE LAMBDA PRODUCTION IN SIGMA-PROTON COLLISIONS AT 23 GeV/c Ph.D. Thesis
Engin Arik 1976 63 p
Avail: Univ. Microfilms Order No. 77-15162

Inclusive Lambda(0) production resulting from Sigma(-) proton collisions has been studied in the AGS negative hyperon beam. The experiment consisted of scattering Sigma(-) particles of momentum equal to 23 Gev/c on a liquid hydrogen target. The differential cross section was obtained as a function of missing mass squared and four-momentum transfer from the Sigma(-) to the Lambda(0). The fit made to the predicted form of the differential cross section in the triple-Regge region indicates that this reaction is mediated by a virtual pion emission between the Sigma(-) and p. The combination of Sigma(-)Lambda(0) pi and Sigma(-)Sigma(0) pi coupling constants was determined.
Dissert. Abstr.

N78-10858 California Inst. of Tech., Pasadena.
THE STRUCTURE OF THE NEUTRAL CURRENT COUPLING IN HIGH ENERGY NEUTRINO-NUCLEON INTERACTIONS Ph.D. Thesis
Frank Smith Merritt 1977 139 p
Avail: Univ. Microfilms Order No. 77-14917

The Lorentz structure of neutral current coupling was determined. A narrow band neutrino beam was used to provide separate neutrino and antineutrino fluxes, each consisting of two energy bands. Deep inelastic inclusive neutrino-nucleon interactions were observed in an instrumented steel target-calorimeter, which measured the total energy of the hadrons produced in each event. The neutral current coupling was determined by comparing the hadron energy distributions of neutrino and antineutrino neutral current events. An analysis of the charged-current data was carried out to determine the background of charged-current events with unobserved muons, and to provide a normalization for the neutral current data. Dissert. Abstr.

N78-10859 Oregon Univ., Eugene.
HIGH SPEED MOTION NEUTRON RADIOGRAPHY Ph.D. Thesis
Richard Henry Bossi 1977 169 p
Avail: Univ. Microfilms Order No. 77-14061

A system to perform neutron radiographic analysis of dynamic events taking place over the order of several milliseconds has been developed. The design consists of a TRIGA reactor capable of pulsing to 3000 MW peak power, a neutron beam collimator with an L/D of about 30:1, lithium fluoride-zinc sulphide neutron scintillator screen, an image intensifier and a 16 mm high speed movie camera. The TRIGA reactor pulse and beam port collimator combine to yield a peak thermal neutron flux of about 4.2 x 10 to the 11th power n/cu cm sec at the object with a pulse width of 9 milliseconds. During this pulse duration sequential neutron radiographs are taken by the imaging system which detail any movement occurring in the object.
Dissert. Abstr.

N78-10860 Illinois Univ., Urbana-Champaign.
INTEGRAL TESTING OF NEUTRON CROSS SECTIONS USING SIMULTANEOUS NEUTRON AND GAMMA-RAY MEASUREMENTS Ph.D. Thesis
Daniel Thomas Ingersoll 1977 96 p
Avail: Univ. Microfilms Order No. 77-14964

Two response matrices were used to unfold the simultaneous measurements of the neutron and the gamma-ray leakage from a cf 2.52 source inside a 25-cm diam niobium sphere. The spectra were compared to ANISN discrete ordinate calculations to provide an integral test of niobium fast neutron cross sections. Calculations based on ENDF/B-3 data were in reasonably good agreement for both the neutron and gamma-ray leakage, while ENDF/B-4 data gave considerably poorer agreement with the measured gamma ray leakage. It is felt that inappropriate treatment of the inelastic cross section was largely responsible for the observed discrepancies. Dissert. Abstr.

N78-10861*# Georgia Inst. of Tech., Atlanta. School of Nuclear Engineering.
ANALYSIS OF THE GAS CORE ACTINIDE TRANSMUTATION REACTOR (GCATR) Semiannual Report
J. D. Clement and J. H. Rust 1 Sep. 1977 142 p refs
(Grant NsG-1288)
(NASA-CR-155221) Avail: NTIS HC A07/MF A01 CSCL 18E

Design power plant studies were carried out for two applications of the plasma core reactor: (1) As a breeder reactor, (2) As a reactor able to transmute actinides effectively. In addition to the above applications the reactor produced electrical power with a high efficiency. A reactor subsystem was designed for each of the two applications. For the breeder reactor, neutronics calculations were carried out for a U-233 plasma core with a molten salt breeding blanket. A reactor was designed with a low critical mass (less than a few hundred kilograms U-233) and a breeding ratio of 1.01. The plasma core actinide transmutation reactor was designed to transmute the nuclear waste from conventional LWR's. The spent fuel is reprocessed during which 100% of Np, Am, Cm, and higher actinides are separated from the other components. These actinides are then manufactured as oxides into zirconium clad fuel rods and charged as fuel assemblies in the reflector region of the plasma core actinide transmutation reactor. In the equilibrium cycle, about 7% of the

actinides are directly fissioned away, while about 31% are removed by reprocessing. Author

N78-10862# California Univ., Livermore. Lawrence Livermore Lab.
BEAM-PLASMA INSTABILITY IN ION BEAM SYSTEMS USED IN NEUTRAL BEAM GENERATION
E. B. Hooper, Jr. Feb. 1977 12 p
(Contract W-7405-eng-48)
(UCID-17404) Avail: NTIS HC A02/MF A01

The beam-plasma instability is analyzed for the ion beams used for neutral beam generation. Both positive and negative ion beams are considered. Stability is predicted when the beam velocity is less than the electron thermal velocity; the only exception occurs when the electron density accompanying a negative ion beam is less than the ion density by nearly the ratio of electron to ion masses. For cases in which the beam velocity is greater than the electron thermal velocity, instability is predicted near the electron plasma frequency. ERA

N78-10863# California Univ., Livermore. Lawrence Livermore Lab.
MEASURING HYDROGEN-ISOTOPE DISTRIBUTION PROFILES
Carl H. Poppe, Robert W. Selden, ed., Kent L. Cummings, ed., Richard B. Crawford, ed., and Judyth K. Prono, ed. Jan. 1977 38 p refs
(UCRL-52000-77-1) Avail: NTIS HC A03/MF A01

A nondestructive technique was developed for measuring the depth distribution of hydrogen isotopes absorbed or implanted near the surface of any material. The method allows real-time study of the inventory and diffusion of hydrogen, deuterium, and tritium. Briefly, the technique involves bombarding the surface with a monoenergetic beam of ions chosen for their ability to react with the hydrogen isotope in question and produce fast neutrons. The energy distribution of the neutrons is a sensitive indicator of the energy of the bombarding particles at the instant of reaction, and hence of the depth of the reaction sites below the surface of the material. A sensitivity of one part per million was obtained for tritium in copper. The technique is applicable to several energy-related materials problems. ERA

N78-10864# International Atomic Energy Agency, Vienna (Austria).
NEAR TERM FEASIBILITY OF NUCLEAR REACTOR FOR SEA-WATER DESALTING: COUPLING OF STANDARD CONDENSING NUCLEAR POWER STATIONS TO LOW GRADE HEAT MULTIEFFECT DISTILLATION PLANTS
J. Adar, S. Manor, and M. Schaal 1976 9 p refs Presented at Intern. Conf. on Nucl. Power and its Fuel Cycles, Salzburg, Austria, 2 May 1977
(IAEA-CN-36/52; CONF-770505-236) Avail: NTIS (US Sales Only)HC A02/MF A01; ERDA Depository Libraries

Flow sheets, heat and mass balances were prepared for two standard sizes of nuclear steam supply systems and turbines (1882sup(Mwth) and 2785sup(Mwth)), two back-pressures (5 1/2 in and 7 in Hg), and corresponding desalination plants. Only standard equipment is being used in the steam and electricity producing plant. The desalination plant consists of 6 to 12 parallel double lines, each of them similar to a large prototype now being designed and which is to be coupled to an old fossil power station. Water production varies between 50 and 123 sup(us MGD) and water cost between 23 and 36 sup(cents)/cu M. Total energy requirements of the desalination plant represent only 19 to 50% of the total water cost as against 75% for a single purpose plant. Costs are based on actual bids for the power plant and acutal estimates for the desalination prototype. The operation is designed to be flexible so that the power plant can be operated either in conjunction with the desalination plant, or as a single purpose plant. ERA

74 OPTICS

Includes light phenomena.

N78-10865 California Univ., San Diego.
AN ANALYSIS OF COHERENT UNDERWATER IMAGING SYSTEMS BASED ON THE THEORY OF PARTIAL COHERENCE AND AN OPTICAL HETERODYNE DETECTION SYSTEM FOR MEASURING TEMPORAL FLUCTUATIONS OF SCATTERED FIELD AMPLITUDE AND PHASE Ph.D. Thesis
Steven Elden Moran 1977 114 p
Avail: Univ. Microfilms Order No. 77-13686

An optical heterodyne detection system capable of recording the temporal fluctuations of the scattered field amplitude and phase designed, constructed and used to measure the amplitude and phase fluctuations of selected angular spectrum components of the scattered field obtained by illuminating a synthetic sea water sample with a coherent plane wave. The temporal records of amplitude and phase were used to calculate estimates of the angular-temporal spectrum and second order correlation function at selected small scatter angles. The measured angular-temporal spectra provide experimental evidence supporting the theoretical prediction that the temporal spectrum half width is a monotonically increasing function of the scatter angle. Dissert. Abstr.

N78-10866 Arizona Univ., Tucson.
INSTRUMENTS FOR MEASURING PROPERTIES OF INFRARED TRANSMITTING OPTICAL MATERIALS Ph.D. Thesis
Benjamin Curtis Platt 1976 147 p
Avail: Univ. Microfilms Order No. 77-15334

Various methods for measuring or monitoring the homogeneity of the refractive index of infrared transmitting optical materials over a temperature range of 77 K to 523 K and covering the 8 to 14 micrometer spectral region are discussed. A technique similar to the Schlieren method and the knife edge test was developed and a scanning interferometer designed. Problems associated with the transmission and reflection of heated samples are explored. Procedures for correcting the chart reading in laboratory spectrophotometers by compensating for the radiation emitted from the sample are given. Methods of eliminating the sample emittance from the system signals are also presented. Dissert. Abstr.

N78-10867# Aerospace Corp., El Segundo, Calif. Aerophysics Lab.
GEOMETRIC THEORY OF MOVING GRID WAVEFRONT SENSOR Interim Report
Eugene B. Turner 30 Jun. 1977 18 p refs
(Contract F04701-76-C-0077; DARPA Order 2843)
(AD-A042432; TR-0077(2756)-2; SAMSO-TR-77-128) Avail: NTIS HC A02/MF A01 CSCL 20/6

A geometric optics analysis is made for a wavefront sensor that uses a moving Ronchi grid. It is shown that by simple data processing a signal proportional to the gradient of the distorted wavefront can be obtained for each element of an array of photodetectors that cover the entire image of a telescope aperture. The effect of diffraction is calculated for this system. This shows the limitations and provides a justification for the geometric analysis. Author (GRA)

N78-10868# Massachusetts Inst. of Tech., Cambridge. Architecture Machine Group.
COLOR TRANSPARENCY EFFECTS FROM MOSAICS OF OPAQUE COLOR Final Report, 15 Jun. 1976 - 14 Jun. 1977
Richard A. Bolt, Nicholas Negroponte, and Victor Tom Jun. 1977 48 p refs
(Contract DAAG29-76-C-0037; DA Proj. 1T1-61102-BH-57) (AD-A042279; ARO-14157.1-EL) Avail: NTIS HC A03/MF A01 CSCL 20/6

Principles of color scission, first demonstrated by Heider in 1933, were stated by Metelli (1970, 1974) for achromatic color. Such principles, together with certain figural constraints, can form the basis of perceptual transparency effects arising from mosaics of opaque color. The work described extends Metelli's lead into full chromatic color space. An illustrative application is given of how dynamic transparency effects were implemented

on a computer-driven color raster-scan display. The potential utility of such displays is discussed. Author (GRA)

N78-10869# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
IR WINDOW STUDIES Final Report, 1 Sep. 1975 - 1 Sep. 1976
John H. Marburger and Michael Bass Griffiss AFB, N. Y. RADC Apr. 1977 102 p refs
(Contract F19628-76-C-0162; ARPA Order 2055)
(AD-A042561; RADC-TR-77-155) Avail: NTIS HC A06/MF A01 CSCL 17/5

Research concerned with several aspects of the infrared laser window problem is described. Measurements of the Hall effect and electrical conductivity were used to study defects in ZnSe and it was found that a defect model governed by ionic defects can be developed. Pulsed laser damage studies revealed that there are still significant sample to sample variations even in today's so-called improved materials. GRA

N78-10870# Philips Labs., Briarcliff Manor, New York.
DEVELOPMENT OF AN OPTICAL DISC RECORDER Quarterly Technical Report, 1 Apr. - 30 Jun. 1977
G. Kenney, F. Zernike, D. Lou, A. Milch, and J. Wagner Jul. 1977 18 p
(Contract N00014-76-C-0441; ARPA Order 0380)
(AD-A043468) Avail: NTIS HC A02/MF A01 CSCL 14/3

A recorder test fixture was assembled from previously tested components. A single-color DRAW optical system was designed, built and tested. Life testing of tellurium and bismuth films has continued with no change observed after 6000 hours at 90 C. Improved air sandwich disc configurations with metal hubs and supports were studied. A comparison of the optical disc and the best commercially available magnetic storage devices is given. Author (GRA)

N78-10871# RCA Labs., Princeton, N. J.
GRANULAR MATERIALS FOR UV FILTER Final Report, 1 May 1976 - 30 Apr. 1977
E. K. Sichel and J. I. Gittleman May 1977 31 p refs
(Contract N00014-76-C-0858)
(AD-A043296; PRRL-77-CR-19) Avail: NTIS HC A03/MF A01 CSCL 17/5

We have tested the potential of several sputtered cermets as a component in a solar-blind UV filter. Films made of metal grains embedded in an insulating matrix may exhibit a strong optical absorption which is absent in the bulk metal. The dimensions of the grains are much smaller than the wavelengths of the radiation which is relevant to the filter problem. Under this condition, the optical properties of the cermet may be described by the Maxwell-Garnett theory. GRA

N78-10872# Honeywell Radiation Center, Lexington, Mass.
AUTOMATED IMAGE ENHANCEMENT TECHNIQUES FOR SECOND GENERATION FLIR Interim Report
Aug. 1977 174 p
(Contract DAAG53-76-C-0195)
(AD-A043572; HRC-77-5-1) Avail: NTIS HC A08/MF A01 CSCL 17/5

This document reports on automated image enhancement techniques for second generation forward looking infrared systems. Section 2 covers the primary image processing functions (in a second generation FLIR) for the derivation of a video signal, free of artifacts, from the detector array. Section 3 deals with interframe processing. It is shown how successive frames of moving FLIR video may be put into registration--making possible any of a number of useful interframe processing functions. Auto-focus is covered in Section 4. The various factors which can cause a FLIR to be defocused are discussed. In Section 5 two approaches to the problem of contrast enhancement are presented. GRA

N78-10873# Human Engineering Labs., Aberdeen Proving Ground, Md.
COMPUTING INTERNAL COCKPIT REFLECTIONS OF EXTERNAL POINT LIGHT SOURCES FOR THE MODEL YAH-64 ADVANCED ATTACK HELICOPTER LOW GLARE CANOPY DESIGN Final Report
Christopher C. Smyth Jul. 1977 64 p refs
(AD-A043367; HEL-TM-24-77) Avail: NTIS HC A04/MF A01 CSCL 20/6

The US Army Human Engineering Laboratoy (HEL) has developed a computer program for computing the internal cockpit reflections on the transparent canopy surfaces of external point light sources. Computations have been completed for the Model YAH-64 Advanced Attack Helicopter (low glare canopy design). The results show that primary reflections as seen from the pilot's position are possible on (1) the upper rear corners of the forward side canopy surfaces, (2) the upper edges of the rear sides, and (3) the sides of the top surface. Computations have also been completed for the copilot's position and show possible reflections on the front and side surfaces. A computer graphics output is used to show reflection points on canopy layouts and perspectives of the cockpit. Author (GRA)

N78-10874# McDonnell Aircraft Co., St. Louis, Mo.
FOVEAL LENS FEASIBILITY STUDY, 8 TO 14 MICRON SPECTRAL REGION Final Report, 1 Jun. 1976 - 31 Mar. 1977
Ralph W. Fischer, Rodger D. Helmick, George Licis, and Alfred Rosenfeld May 1977 85 p refs
(Contract N00014-76-C-0699)
(AD-A043341; ONR-CR-213-129-1-1E) Avail: NTIS MF A01 CSCL 17/5

This study proves feasibility and establishes preliminary design for a nonlinear lens capable of imaging in the 8-14 micron spectral region. When coupled to existing linear infrared scanners this lens can fully support human vision in both field of view (160 deg) and resolution (1 cycle/milliradian). This capability is achieved through optical distortion which causes focal length to vary by a ratio of 50/1 from an axis (2 inches) to 80 deg field angles (.04 inch). The lens has an F number of two and a clear aperture of eight inches in diameter. Author (GRA)

N78-10875# Laser Diode Labs., Inc., Metuchen, N. J.
LIGHT EMITTING DIODES FOR FIBER OPTIC COMMUNICATIONS Quarterly Report, 1 Jan. - 31 Mar. 1977
Albert Gennaro 29 Jun. 1977 46 p
(Contract DAAB07-76-C-8135)
(AD-A043727; QR-2) Avail: NTIS HC A03/MF A01 CSCL 09/1

The design and fabrication of high speed etched-well light emitting diodes for fiber optic communications is discussed with regard to materials synthesis via LPE, wafer fabrication, and device assembly in a manufacturing environment. Author (GRA)

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N78-10876 City Univ. of New York.
THE EFFECTS OF AN EXTERNAL MAGNETIC FIELD ON DISCRETE-PARTICLE PROCESSES IN A PLASMA Ph.D. Thesis
John Edward Tigner 1977 154 p
Avail: Univ. Microfilms Order No. 77-13674

The inclusion of an external magnetic field in the microscopic description of a plasma is investigated. This inclusion becomes necessary when the magnetic field is strong enough for the thermal gyro-radius to be less than the Debye length. This particular ordering of the length parameters of a plasma is investigated in both two and three-dimensional systems. It is found that the appropriate kinetic equation for such an ordering is the Fokker-Planck equation since the magnetic field acts to screen the coulomb potential in isolated two-body interactions. It is not necessary to invoke the dielectric nature of the plasma in order to insure the convergence of the collision integrals, and, therefore, the kinetic theory of a strongly magnetized plasma will, in fact, be simpler than the unmagnetized plasma.
Dissert. Abstr.

N78-10877 Illinois Univ., Urbana-Champaign.
PRODUCTION OF UNIFORM MICROPELLETS OF HYDROGEN AND HYDROGEN PELLET INJECTION ON ORMAK Ph.D. Thesis
Christopher Alan Foster 1977 133 p
Avail: Univ. Microfilms Order No. 77-14947

The interaction of a hydrogen pellet with a high temperature plasma is studied. An apparatus was developed which produced 70 micrometer diameter droplets of hydrogen by the acoustic disintegration of a liquid jet. The liquid drops were frozen and injected into vacuum at a speed of 95 M/sec. Hydrogen pellets were injected into the ORMAK plasma. The pellet-plasma interaction was monitored by the enhanced neutral line emission of the ablating molecular hydrogen excited by the plasma electrons. The data indicated a pellet lifetime of 350 - 450 microseconds sec which implied an injection distance of 3.3 to 4.1 cm into the edge of the ORMAK plasma along the injection path which was at an angle of 45 deg from a radial line. Movies taken of the pellets entering the plasma showed a luminuous cloud much larger than the pellets. A model was developed in which the ablation rate of the pellets was regulated by the dynamic formation of a dense shielding cloud surrounding the pellet. Dissert. Abstr.

N78-10878 Illinois Univ., Urbana-Champaign.
MODEL OF AN ABLATING SOLID HYDROGEN PELLET IN A PLASMA Ph.D. Thesis
Paul Brownlee Parks 1977 162 p
Avail: Univ. Microfilms Order No. 77-15000

An analytical model for the ablation dynamics of a solid hydrogen pellet in a plasma was formulated. Molecules were vaporized off the surface of the pellet as a result of the elevated pellet surface temperature. The ablated molecules flowed away from the surface of the pellet and simultaneously attenuated the incoming plasma electron energy flux due to elastic and inelastic collisions. The resulting thermal energy source provided to the flow controls the velocity of the flow just over the pellets' surface and provided a subtle connection between the pellet surface conditions and the gas dynamic expansion of the ablation cloud. Steady state gas dynamic equations for spherical geometry were cast in a form suitable for an analysis of the singular point for the velocity of the flow. Dissert. Abstr.

N78-10879 California Univ., Davis.
CALCULATION OF TRANSPORT COEFFICIENTS IN AN AXISYMMETRIC PLASMA Ph.D. Thesis
Dana Edward Shumaker 1976 270 p
Avail: Univ. Microfilms Order No. 77-14008

A method of calculating the transport coefficient in an axisymmetric toroidal plasma is presented. This method is useful in calculating the transport coefficients in a Tokamak plasma confinement device. The particle density and temperature are shown to be a constant on a magnetic flux surface. Transport equations are given for the total particle flux and total energy flux crossing a closed toroidal surface. Also transport equations are given for the toroidal magnetic flux. Dissert. Abstr.

N78-10880 Polish Academy of Sciences, Warsaw.
INTRODUCTORY SPECTROSCOPIC STUDIES OF THE CATHODE ZONE OF HIGH-PRESSURE ARC DISCHARGE [WSTEPNE BADANIA SPEKTROSKOPOWE OBSZARU PRZYKATODOWEGO WYSOKOPREZNEGO WYLADOWANIA LUKOWEGO]
Dariusz Wroblewski 17 Mar. 1977 30 p refs In POLISH
Avail: Issuing Activity

Processes occuring in the solid cathode, in the cathode plasma, and on the boundary between these two media were considered in modeling the cathode zone of an arc discharge. Theoretical and experimental works concerning cathode spots are reviewed and introductory spectroscopic studies of the cathode zone of high-pressure arc discharge in mercury vapors are described. A method of determining the intensity of the electric field in the spot utilizing the Stark effect is proposed. Preliminary measurements did not reveal the effect, probably as a result of the inadequate spatial separating ability of the apparatus used. On the basis of the results (significant widening of the visual lines), the density of electron concentration in the plasma of a cathode spot was confirmed. Author

N78-10881# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EXTRACTION OF A LONG-PULSED INTENSE ELECTRON BEAM FROM A PULSED PLASMA BASED ON HOLLOW CATHODE DISCHARGE
Johshin Uramoto May 1977 30 p refs
(IPPJ-288) Avail: NTIS HC A03/MF A01

An intense electron beam was extracted along a uniform magnetic field with a long decay time from a pulsed high density plasma source which is produced with a fast rise time by a secondary discharge based on a dc hollow cathode discharge. Through a back stream of ionized ions from a beam-extracting anode region where a neutral gas was fed, a space charge limit of the electron beam was so reduced that the beam current was determined by an initially injected electron flux and concentrated in a central aperture of the extracting anode. Moreover, the beam pulse width was much extended by the neutral gas feed into the anode space. Author

N78-10882# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CURRENT SUSTAINING BY RF TRAVELLING FIELD IN A COLLISIONAL TOROIDAL PLASMA
Masaji Fukuda and Kiyokata Matsuura Jun. 1977 22 p refs
(IPPJ-292) Avail: NTIS HC A02/MF A01

Phase velocity and filling gas pressure or electron collision frequency were parameters used in an investigation of current generation by the RF traveling field in a collisional toroidal plasma. On the basis of the fluid model used, an electromotive force, which acts as a current driving electric field, is introduced. In a low magnetic field, the current is proportional to the plasma conductivity. The electromotive force is proportional to the absorbed RF power and inversely proportional to the plasma density and the phase velocity of the traveling field. Author

N78-10883*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INWARD TRANSPORT OF A TOROIDALLY CONFINED PLASMA SUBJECT TO STRONG RADIAL ELECTRIC FIELDS
J. Reece Roth, Walter M. Krawczonek, Edward J. Powers (Texas Univ., Austin), Jae Hong (Texas Univ., Austin), and Young Kim (Texas Univ., Austin) 1977 14 p refs Presented at Ann. Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Atlanta, 7-11 Nov. 1977
(NASA-TM-73800) Avail: NTIS HC A02/MF A01 CSCL 20I

Digitally implemented spectral analysis techniques were used to investigate the frequency-dependent fluctuation-induced particle transport across a toroidal magnetic field. When the electric field pointed radially inward, the transport was inward and a significant enhancement of the plasma density and confinement time resulted. Author

N78-10884*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A MODEL FOR PARTICLE CONFINEMENT IN A TOROIDAL PLASMA SUBJECT TO STRONG RADIAL ELECTRIC FIELDS
J. Reece Roth 1977 25 p refs Presented at Ann. Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Atlanta, 7-11 Nov. 1977
(NASA-TM-73814; E-9401) Avail: NTIS HC A02/MF A01 CSCL 20I

A toroidal plasma is confined and heated by the simultaneous application of strong d.c. magnetic fields and electric fields. Strong radial electric fields (about 1 kilovolt per centimeter) are imposed by biasing the plasma with up to 12 negative electrode rings which surround its minor circumference. The plasma containment is consistent with a balance of two processes: a radial infusion of ions in those sectors not containing electrode rings, resulting from the radially inward electric fields; and ion losses to the electrode rings, each of which acts as a sink and draws ions out the plasma in the manner of a Langmuir probe in the ion saturation regime. The highest density on axis which has been observed so far in this steady-state plasma is 6.2 x 10 to the 12th power particles per cubic centimeter, for which the particle containment time is 2.5 milliseconds. The deuterium ion kinetic temperature for these conditions was in the range of 360 to 520 eV. Author

N78-10885# Naval Research Lab., Washington, D. C.
AN INVESTIGATION OF 10 TO THE 12TH POWER W PER SQ CM FOCUSED REB DEPOSITION OF THICK ALUMINUM TARGETS Interim Report
D. J. Johnson, D. J. Nagel, and W. F. Oliphant May 1977 24 p refs
(AD-A042211; NRL-MR-3521) Avail: NTIS HC A02/MF A01 CSCL 20/6

The VUV-emission from 6061-T6 aluminum targets, exposed to an intense focused electron beam, and ions accelerated to the diode potential were examined to study the electron absorption mechanism for a 1 meV electron beam with current density of MA/sq cm. The VUV-emission was observed with aluminum cathode X-ray diode operated with and without 1/2 micrometer aluminum filters and a near normal incidence grating spectrograph. Carbon ions were observed with a Thomas mass spectrograph and their charge state used to estimate the anode plasma temperature. The VUV-emission and carbon charge states observed are consistent with classical electron deposition and indicate an anode surface temperature of a few eV with the peak temperature occurring at the time of impedance collapse. GRA

N78-10886# TRW Defense and Space Systems Group, Redondo Beach, Calif.
PULSED PLASMA LOSS AND ACCELERATION MECHANISMS IN STRONG BIAS MAGNETIC FIELDS Interim Report, 1 Jun. 1976 - 31 May 1977
C. L. Dailey and R. H. Lovberg Jul. 1977 40 p refs
(Contract F44620-76-C-0107)
(AD-A042809; AFOSR-77-0828TR) Avail: NTIS HC A03/MF A01 CSCL 20/9

Results of the first year of a study of plasma acceleration in the presence of a strong applied bias magnetic field are described. A theoretical model has shown that acceleration efficiency is limited to 50% for a constant field strength. However, it can be increased to more than 80% by applying a bias field that decreases in the direction of acceleration. Experiments with argon in an accelerator of this type are described which show an acceleration efficiency increasing with 1sp to a value of 80% at 2000 seconds 1sp. Steady Gas flow was used for the experiments with current supplied for 0.8 m sec from a pulse line. Impulse was indicated by the deflection of the bias field magnet which was suspended as an impulse pendulum.
Author (GRA)

N78-10887# Naval Research Lab., Washington, D. C.
LOW FREQUENCY INSTABILITY OF LIQUID LINER IMPLOSIONS DRIVEN BY MULTIPLE FREE PISTONS
A. L. Cooper and P. J. Turchi Jun. 1977 20 p refs
(RR0110941)
(AD-A043284; NRL-MR-3522) Avail: NTIS HC A02/MF A01 CSCL 20/9

The Rayleigh-Taylor instability is studied for an unstable interface composed of rigid finite elements. For wave lengths associated with the finite element scale size the classical Rayleigh-Taylor growth rates obtain. Wave lengths which are short compared with the element scale size are constrained by the rigid finite elements. The consequences of this behavior are discussed with respect to captive liner configurations for imploding liners. Author (GRA)

N78-10888# California Univ., Livermore. Lawrence Livermore Lab.
PLASMA EXPERIMENTS WITH 1.06-MUON M LASERS AT THE LAWRENCE LIVERMORE LABORATORY
H. G. Ahlstrom, J. F. Holzrichter, K. R. Manes, E. K. Storm, M. J. Boyle, K. M. Brooks, R. A. Haas, D. W. Phillion, and V. C. Rupert 20 Dec. 1976 42 p refs Presented at the 4th Intern. Workshop on Laser Interaction and Related Plasma Phenomena, Troy, N. Y., 8-12 Nov. 1976
(Contract W-7405-eng-48)
(UCRL-77943-Rev-2; Conf-761155-3) Avail: NTIS HC A03/MF A01

Irradiation experiments were performed with Nd: YAG glass laser systems: the two-beam Janus (less than or equal to 40 J/100 ps, about 0.4 TW) and Argus (less than or equal to 140 J, 35 ps, about 4 TW), and the single beam Cyclops (less than or equal to 70 J/100 ps, about 0.7 TW). Two classes of targets have been used: glass microshells (about 40 to 120 mu m in diameter with about 0.75-mu m-thick walls) filled with an equimolar deuterium-tritium mixture, and disks (about 160 to 600 mu m in diameter and approx. 10 mu m thick) of several compositions. The targets were supported in vacuum (pressure less than or equal to 0.00001 Torr) by thin glass stalks. Results related to the propagation, absorption, and scattering of laser light by both spherical and planar targets are reported. ERA

N78-10889# Columbia Univ., New York. Plasma Physics Research Lab.
COLUMBIA TORUS II DESIGN REPORT
Jan. 1977 20 p
(Contract EY-76-S-02-2456)
(COO-2456-41) Avail: NTIS HC A02/MF A01

Torus II was designed to generate a hot (greater than or equal to 100 eV) plasma for purposes of doing research on high-beta MHD stability and equilibrium problems in axisymmetric toroidal geometry. Programming of the Torus II fields is shown. The sequence of events can be divided into (a) preionization phase, (b) preheating phase, and (c) hot, high-beta Tokamak phase. Some mechanical and electrical design features are described. The capacitor bank system is also described. ERA

N78-10890# Oak Ridge National Lab., Tenn. Physics Div.
ATOMIC DATA FOR CONTROLLED FUSION RESEARCH
C. F. Barnett, J. A. Ray, E. Ricci, M. I. Wilker, E. W. McDaniel (Georgia Inst. of Technol.), E. W. Thomas (Georgia Inst. of Technol.), and H. B. Gilbody (Queens Univ., Belfast) Feb. 1977 364 p refs
(Contract W-7405-eng-26)
(ORNL-5206-Vol-1) Avail: NTIS HC A16/MF A01

A graphical and tabular compilation of atomic and molecular cross sections of interest to controlled thermonuclear research is presented. The cross sections are tabulated and graphed as a function of energy for collision processes involving heavy particles, electrons, and photons with atoms and ions. Also included are sections on data for particle penetration through macroscopic matter, particle transport properties, particle interactions with surfaces, and pertinent charged particle nuclear cross sections and reaction rates. ERA

N78-10891# Pennsylvania State Univ., University Park.
STUDY OF FLOW AND LOSS PROCESSES AT THE ENDS OF A LINEAR THETA PINCH Progress Report, 1 Jun. 1976 - 31 May 1977
T. M. York and E. H. Klevans Feb. 1977 132 p refs
(Contract EY-76-S-02-4020)
(COO-4020-3) Avail: NTIS HC A07/MF A01

Experimental and analytical studies initiating and supporting research on flow and energy losses at the ends of a linear theta pinch have been carried out. Spectroscopic determination of preionization has been made. A ruby laser Thomson scattering diagnostic has been designed and is being procured. A study of transient plasma behavior in a 10 cm theta pinch has been carried out with a Twyman-Green interferometer using a 7 mW He-Ne CW laser. Pressure, electric field, and velocity probe diagnostics have received preliminary testing. Design work has been completed for the doubling of pinch length and energy storage system. ERA

N78-10892# Los Alamos Scientific Lab., N. Mex.
EFFECTS OF FLUX CONSERVATION ON THE FIELD CONFIGURATION IN SCYLLAC
P. C. T. VanderLaan Apr. 1977 13 p refs
(Contract W-7405-eng-36)
(LA-6767-MS) Avail: NTIS HC A02/MF A01

Flux conservation in Scyllac-type experiments shows up in two ways. First, the poloidal flux between the outside edge of the plasma and the inside of the coil is conserved. This requires a net longitudinal current in the plasma to cancel the poloidal flux and an expression for this net current is derived. The flux conservation inside the conducting plasma leads to a conservation of the local rotational transform. Since the pinch itself is surrounded by a well-conducting low-density plasma, the rotational transform is conserved in a wide region. Depending on the time history of the applied fields, volume currents are induced in this region, as is shown for two examples. Although an additional

capacitor bank can be used to cancel the net current, a cancellation of all the volume currents is extremely difficult. The resulting equilibrium configurations differ considerably from the Scyllac equilibria without volume currents, which are used in stability calculations. ERA

N78-10893# Princeton Univ., N. J. Plasma Physics Lab.
COLLISIONAL DAMPING OF LANGMUIR WAVES IN THE COLLISIONLESS LIMIT
S. P. Auerbach Apr. 1977 41 p
(Contract EY-76-C-02-3073)
(PPPL-1339) Avail: NTIS HC A03/MF A01

Linear Langmuir wave damping by collisions is studied in the limit of collision frequency nu approaching zero. In this limit, collisions are negligible, except in a region in velocity space, the boundary layer, centered about the phase velocity. If the ratio kappa = (collisional equilibrium time in the boundary layer) : (Landau damping time) is small, the boundary layer width scales as nu/sup 1/3/, and the perturbed distribution function scales as nu/sup -1/3. The damping rate is thus independent of nu, although essentially all the damping occurs in the collision-dominated boundary layer. Solution of the Fokker-Planck equation shows that the damping rate is precisely the Landau (collection) rate. The damping rate is independent of kappa, although the boundary layer thickness is not. ERA

N78-10894# Argonne National Lab., Ill.
REVISED DESIGN FOR THE TOKAMAK EXPERIMENTAL POWER REACTOR
W. M. Stacey, Jr., M. A. Abdou, and J. N. Brooks Mar. 1977 85 p refs
(Contract W-31-109-eng-38)
(ANL/FPP/TM-77) Avail: NTIS HC A05/MF A01

A preliminary design has been identified for the Tokamak Experimental Power Reactor (EPR). The revised EPR design is simpler, more compact, less expensive and has somewhat better performance characteristics than the previous design, yet retains many of the previously developed design concepts. This report summarizes the principle features of the new EPR design, including performance and cost. ERA

N78-10895# Japan Atomic Energy Research Inst., Tokyo.
EVALUATION OF NEUTRON STREAMING THROUGH INJECTION PORTS IN A TOKAMAK-TYPE FUSION REACTOR
T. Ide, Y. Seki, and H. Iida Mar. 1976 18 p
(JAERI-M-6475) Avail: NTIS (US Sales Only)HC A02/MF A01; ERDA Depository Libraries

The effects of neutron streaming through injection ports in the fusion reactor were studied, especially those on tritium breeding ratio and the shielding of the superconducting magnet. By placing the injection ports in the blanket, the tritium breeding ratio decreases by up to 1.3%; the shielding problem of the superconducting magnet is of concern. ERA

N78-10896# Technische Hogeschool, Eindhoven (Netherlands).
SHOCK TUBE STUDY OF THE COEFFICIENT OF THERMAL CONDUCTIVITY OF HELIUM, NEON, ARGON AND KRYPTON
P. J. Vrugt 19 Nov. 1976 107 p
(INIS-mf-3404) Avail: NTIS (US sales Only)HC A06/MF A01; ERDA Depository Libraries

An alternative method of determing the coefficients of thermal conductivity of monatomic gases is given using a shock tube study. The subject of investigation is the thermal boundary layer that develops at the end wall of the shock tube after shock wave reflection. It is shown that the coefficients of thermal conductivity can be determined in a given temperature range by measuring the density gradient at a single point inside the thermal boundary layer as a function of time. In doing so, no specific functional relationship between the coefficient of thermal conductivity and the temperature has to be preassumed which is an important advantage of the present method over previous experimental techniques. ERA

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N78-10897 Pennsylvania State Univ., University Park.
A STUDY OF SELECTED LOW TEMPERATURE FERROIC CRYSTALS Ph.D. Thesis
Kittredge Dunning Seely 1976 185 p
Avail: Univ. Microfilms Order No. 77-9597

The law temperature dielectric behavior of lithium thallium tartrate monohydrate (LTT) and a series of doped and undoped single crystal SrTiO3 samples were studied. The dielectric measurements were made from 4.2 to 300 K over a range of frequencies with dc bias applied to selected samples. There were two relaxation phenomena observed in the samples. A single loss peak was discovered at 9 K for all samples. The LTT showed departures from classical Curie-Weiss behavior at low temperatures. These departures were found to occur below 13 K. Dielectric hysteresis was observed below 12 K. To carry out the measurements, sample and control equipment were designed and constructed. Also, a comprehensive study of precision in the measurement process was completed. Dissert. Abstr.

N78-10898 Illinois Univ., Urbana-Champaign.
ELECTRICAL PROPERTIES OF SOME LOW-DIMENSIONAL COMPOUNDS Ph.D. Thesis
Mark Jonathan Schaffman 1977 128 p
Avail: Univ. Microfilms Order No. 77-15011

Data from heat capacity, infrared, and magnetic susceptibility experiments confirm that the effective Peierls transition temperature in GCP is higher than that of KCP, and is greater than room temperature. The temperature dependence of electrical conductivity in GCP was investigated and found to result from a solitary wave excitation in the charge-density wave state. The differences in transition temperature and conductivity of KCP and GCP are discussed in terms of structural differences between the two materials. Electrical conductivity and heat capacity measurements of TTF-DETCHQ reveal a metal-insulator transition temperature higher than that of TTF-TCNQ. This difference is explained in terms of the difference in charge transfer, using a single band model. An electrical conductivity transition in the two-dimensional compound Ti(1+x)Se2 also was observed, and the transition temperature determined by measuring directly the temperature derivative of the resistivity. Dissert. Abstr.

N78-10899 California Inst. of Tech., Pasadena.
SILICIDE FORMATION AND THE INTERACTION OF METALS WITH POLYCRYSTALLINE Si Ph.D. Thesis
Johnson Olufemi Olowolafe 1977 168 p
Avail: Univ. Microfilms Order No. 77-14918

The main factors affecting solid-phase Si-metal interactions are reported. The influence of the orientation of the Si substrates and the presence of impurities in metal films and at the Si-metal interface on the formation of nickel and chromium silicides were demonstrated. The formation and kinetic rate of growth of nickel silicides are strongly dependent on the orientation and crystallinity of the Si substrates; a fact which, up to date, has never been seriously investigated in silicide formation. Impurity contaminations in the Cr film and at the Si-Cr interface are the most dominant influencing factors in the formation and kinetic rate of growth of CrSi2. The potentiality and use of silicides as a diffusion barrier in metallization on silicon devices were also investigated. Dissert. Abstr.

N78-10900 Illinois Univ., Urbana-Champaign.
HEAT CAPACITY STUDIES OF PHASE TRANSITIONS IN A SERIES OF HOMOLOGOUS LIQUID CRYSTALS USING THE AC HEAT CAPACITY TECHNIQUE Ph.D. Thesis
John Edward Smaardyk 1977 111 p
Avail: Univ. Microfilms Order No. 77-15018

A new calorimeter was developed for organic liquids which utilizes the AC heat capacity technique. It can measure heat capacity changes of 1 part in 10 to the 4th power with a temperature resolution of 0.3 mK. This calorimeter has been used to study the smetic A-nematic phase transition in a series

of homologous liquid crystals. In addition to pure CBOOA, measurements were made on mixtures of CBOOA and the next longer homolog, CBNOA. The character of the transition was found to change from first to second order as the percentage of CBNOA was increased, as predicted by the microsccpic theories of Kobayashi and McMillan. Dissert. Abstr.

N78-10901 Illinois Inst. of Tech., Chicago.
ACOUSTO-ELECTRIC INTERACTIONS IN SEMICONDUCTORS USING THE TWO-BAND MODEL Ph.D. Thesis
Fred Robert Sutherland 1976 126 p
Avail: Univ. Microfilms Order No. 77-13762

The effects of collisions and non-parabolicity of the energy bands on magneto-acoustic phenomena were investigated with special reference to those narrow band gap semiconductors in which the dominant electron-phonon interaction is via the piezoelectric coupling mechanism. The electromagnetic response of the electron system to the piezoelectrically induced electromagnetic field which accompanies the ultrasonic wave in a piezoelectric semiconductor was calculated. Expressions were derived to the effective conductivity tensor for the g-vector parallel to b-vector configuration in the cases of a constant relaxation time and that of an energy dependent relaxation time. For the g-vector transverse to b-vector configuration, only the case of constant relaxation time was considered. The dispersion relation was found from which the absorption coefficient alpha and the relative change in the sound velocity can be determined. Dissert. Abstr.

N78-10902 Massachusetts Univ., Amherst.
CALORIMETRIC STUDY OF FERROELECTRIC TRIGLYCINE SULFATE (TGS) Ph.D. Thesis
Ramiro J. Tobon-Ramirez 1977 280 p
Avail: Univ. Microfilms Order No. 77-15129

The heat capacities of single crystals of triglycine sulfate were measured using both an ac colorimetric technique and the standard adiabatic technique. The ac heat capacity data are converted to standard specific heat values and the resulting data have less random scatter than data reported previously, particularly in the transition region. The data cover the range 0 - 80 C but particular attention was given to the temperature region 30 - 50 C. The ac specific heat technique is discussed and the results of the calculations are compared with previous calculations and with experimental results. Dissert. Abstr.

N78-10903 California Univ., San Diego.
THE ELECTRICAL AND MAGNETIC PROPERTIES OF NOBLE METAL-Ni ALLOYS Ph.D. Thesis
Ernest Howard Tyler 1977 366 p
Avail: Univ. Microfilms Order No. 77-13697

In an attempt to form completely random solid solutions, Au-Ni alloys have been prepared by extremely rapid cooling from the liquid state, using two different techniques. The electrical resistance magnetization, and low-temperature heat capacity of these alloys have been measured and compared with the anomalous behaviors of the Cu-Ni alloys. The results are in qualitative agreement with Cu-Ni alloys. Dissert. Abstr.

N78-10904 Carnegie-Mellon Univ., Pittsburgh, Pa.
MEASUREMENT OF THE PAULI SUSCEPTIBILITY OF SODIUM AND LITHIUM Ph.D. Thesis
Bruce Raymond Whiting 1976 88 p
Avail: Univ. Microfilms Order No. 77-13846

The Pauli susceptibility of sodium and lithium is measured by the magnetic resonance technique of Schumacher and Slichter. The theoretical basis for the experimental method is established on very general grounds and detailed analysis of the data confirms the accuracy of the method. An experimental system was developed which significantly improves the precision of the measurement over that of earlier workers. Results of the susceptibility measurements are 1.092 plus or minus 0.012 X 10 to the minus 6 power (cgs. vol. units) for sodium at 77 K and 2.162 plus or minus 0.037 x 10 to the minus 6 power (cgs. vol. units) for lithium at room temperature. These results agree well with those of other experimental techniques while having a relatively lower uncertainty. Comparison of the results with present theoretical calculations indicates that further development is necessary to account accurately for the susceptibility of a real metal. Dissert. Abstr.

N78-10905 Yale Univ., New Haven, Conn.
FORMATION OF DIMERS IN FREE JETS Ph.D. Thesis
Naisin Lee 1976 110 p
Avail: Univ. Microfilms Order No. 77-14051

A method was developed to calibrate a mass spectrometer for dimer concentration measurements. It is based on determination of total mass flux with a snorkel ionization gauge simultaneously with measurements of monomer and dimer ion currents using a quadrupole mass spectrometer. Measurements of dimer/monomer mole ratio as a function of source pressure were completed at several values of source temperature. Scaling laws for terminal dimer/monomer ion current ratio in free jets were obtained. A sudden-freeze model was used to approximate rate constants for dimer formation in a jet. Dimer formation for each molecular encounter was found to be characterized by an apparent activation energy corresponding to 0.38 times the depth of the intermolecular potential attractive well. A steric factor was also inferred and found to be 0.18, 0.22 and 0.46 for argon, oxygen and carbon dioxide respectively. Dissert. Abstr.

N78-10906 Maine Univ., Orono.
ANOMALOUS ALIGNMENT AND ELECTROHYDRODYNAMIC EFFECTS IN NEMATIC LIQUID CRYSTALS Ph.D. Thesis
William Thomas Flint, Jr. 1976 90 p
Avail: Univ. Microfilms Order No. 77-13732

Anomalous molecular alignment owing to electric fields has been investigated in the nematic phase of the n-p-alkoxybenzoic acids which exhibit a positive dielectric anisotrophy and a positive conductivity anisotropy. The results show that the aligning mechanism which is associated with the ionic conductivity is a well behaved process in these materials. The observed electrohydrodynamic instabilities in p-alkoxybenzoic acids displayed positive dielectric anisotropy. Dissert. Abstr.

N78-10907 Brown Univ., Providence. R. I.
ON THE TRANSPORT COEFFICIENTS OF SUPERFLUID He3 Ph.D. Thesis
Oriol Thomas Valls 1976 121 p
Avail: Univ. Microfilms Order No. 77-14204

A transport equation formalism for a superfluid in a triplet pairing state, including a general method for obtaining the collision integral for any particular pairing state is developed. This formalism is then used to calculate the normal fluid viscosity and thermal conductivity of the super fluid A and B phases of liquid He3. Results are obtained both at temperatures close to T sub c (the critical temperature) and at low temperatures. Close to T sub c it is found that for both phases the viscosity drops very sharply (with infinite derivative) at T sub c, whereas the thermal conductivity varies smoothly. Spin transport is also discussed, and the temperature dependence of the diffusion times is found. The new mechanisms for spin relaxation which are present in the superfluid are studied. Dissert. Abstr.

N78-10908 Princeton Univ., N. J.
THE INFLUENCES OF HYDROGEN BONDING ON THE ELECTRONIC STATES OF BENZOIC ACID Ph.D. Thesis
J. Clayton Baum 1977 589 p
Avail: Univ. Microfilms Order No. 77-14235

Benzoic acid, its ability to act as both a proton donor and acceptor in h-bonding and its tendency to dimerize via these H-bonds were investigated in the ground and excited electronic states. A variety of spectroscopic techniques and molecular orbital calculations were used . The broad band spectra of benzoic acid was examined in a number of solvents at 77 K. High resolution fluorescence, phosphorescence, absorption, and excitation line spectra at 4.2 K were obtained. The vibrational structure of the ground and lowest excited states, and the more subtle influences of H-bonding, were studied in detail on the basis of these data. Dissert. Abstr.

N78-10909 Massachusetts Univ., Amherst.
ELECTRON SCATTERING STUDIES OF Ne-20 AND He-3 ISOTOPES Ph.D. Thesis
Zenon Michael Szalata 1977 170 p
Avail: Univ. Microfilms Order No. 77-15128

Electron scattering was used to study giand resonance excitations of Ne-20 and the rms charge radius of He-3. Electron

with incident energies of 59.5, 89.7, 119.6 MeV were observed at an angle of 75 deg, and with incident energy of 84.7 MeV at an angle of 127.5 deg after scattering from Ne-20. Well defined resonances of E2 transition characteristics were observed at excitation energies of 12.8, 13.5, 14.0, 14.7, 15.3, and 16.5 Mev. Electrons were scattered elastically from a mixture of He-3 and CH4 and the He-3 cross sections of He-3 were measured relative to C-12 in the range of momentum transfer. The He-3 charge radius was found to be 1.902 + or - 0.047 fm. Dissert. Abstr.

N78-10910 Brown Univ., Providence, R. I.
LOW TEMPERATURE THERMAL EXPANSION OF LIQUID HELIUM-4 Ph.D. Thesis
Joseph Ernest Berthold 1976 205 p
Avail: Univ. Microfilms Order No. 77-14089

Thermal expansion of liquid He-4 along the saturated vapor pressure curve at low temperature (0.1 - 0.6K) was measured. The thermal expansion is related to the low momentum region of the He-4 excitation spectrum, and the results of this measurement are analyzed to gain information concerning deviations from linearity in the phonon region of the spectrum. The experimental technique consisted of the measurement of the resonant frequency of a superconducting microwave cavity immersed in the liquid. Measurements were made of the dielectric constant of He-4 at constant density in order to test for temperature dependent violations of the Clausius-Mossotti relation. No such violations were observed. Results of the thermal expansion measurement indicate the existence of a region of anomalous dispersion for low values of wavevector. The dispersion relation can be expressed as a power series in wavevector; coefficient values are given. Dissert. Abstr.

N78-10911 Brown Univ., Providence, R. I.
THE KAPITZA RESISTANCE AND THE REFLECTION OF PHONONS AT INTERFACES BETWEEN A CLASSICAL SOLID AND SEVERAL QUANTUM MATERIALS Ph.D. Thesis
Jay Stark Buechner 1976 151 p
Avail: Univ. Microfilms Order No. 77-14095

Reflection coefficients were measured of phonons incident upon an interface between a classical crystalline dielectric (silicon) and several condensed gases, including liquid and solid He-4, solid H2, solid D2 and solid Ne. The reflection coefficients from liquid and solid He-4, solid H2, and solid D2 were found to be of similar size for all phonon polarizations. In addition, for phonons of relatively high frequence, the reflection coefficients from these materials were much smaller than the predictions of the acoustic-mismatch theory. On the other hand, the reflection coefficients from solid Ne were found to be close to the predictions of this theory. It is concluded that the method of heat transfer from a classical solid to He-4, H2, and D2, is the same and is unique to these materials. The fact that these materials exhibit strong quantum properties is thought to be relevant to the problem of describing the heat transfer mechanism theoretically.
Dissert. Abstr.

N78-10912 Brown Univ., Providence, R. I.
THE EFFECTS OF UNIAXIAL STRESS ON THE ELECTRO-REFLECTANCE SPECTRUM OF GaAs AND Ge Ph.D. Thesis
Meera Chandrapal 1976 142 p
Avail: Univ. Microfilms Order No. 77-14099

The E sub 0 - E sub 0 + delta sub 0 and E sub 1 - E sub 1 + delta sub 1 transitions in GaAs and Ge were studied under uniaxial stress along the (001) and [111] directions using the technique of Schottky barrier electroreflectance. Information about deformation potentials, spin exchange of excitons and interband reduced masses was obtained. For the E sub 0 - E sub 0 structure, shear deformation potentials independent of spin and dependent on spin were determined, as well as the hydrostatic deformation potential. Interband reduced masses were determined for the E sub 0 transition in Ge at a high stress when the degenerate valence band is split by the reduced symmetry. Conclusive evidence of contributions from the electron-hole Coulomb interaction to the E sub 1 - E sub 1 + delta sub 1 structure at 300 K and 77 K was obtained. A polarization dependent splitting for (001) stress is explained on the basis of spin exchange of excitons. In addition, deformation potentials due to shear hydrostatic, and intraband effects were determined. Dissert. Abstr.

N78-10913 Brown Univ., Providence, R. I.
HYDRODYNAMIC MODEL FOR SURFACE PLASMONS IN METALS AND DEGENERATE SEMICONDUCTORS Ph.D. Thesis
Adolfo German Eguiluz 1976 113 p
Avail: Univ. Microfilms Order No. 77-14110

An extension of Bloch's original hydrodynamic model was used to study an inhomogeneous electron gas capable of self oscillations about a ground state. The qualitative features of the model are illustrated by a simple two step profile in which the low electron density surface region acts as a transition layer between the bulk solid and vacuum. The dispersion relation of both the regular surface plasmon and the higher multipole excitations which occur for sufficiently diffuse profiles, were studied for a wide range of wavelengths, from the optical to the non-retarded or electrostatic limit. Results obtained are in agreement with detailed numerical calculations for models with smooth surface electron density contours. Dissert. Abstr.

N78-10914 Maine Univ., Orono.
A STUDY OF THE MOLECULAR DYNAMICS OF CHOLESTERIC LIQUID CRYSTALS USING PULSED NUCLEAR MAGNETIC RESONANCE Ph.D. Thesis
Michael Evans Field 1976 118 p
Avail: Univ. Microfilms Order No. 77-13731

Pulsed nuclear magnetic resonance techniques were employed to measure the second moment and rotating frame relaxation times of various cholesteric-nematic mixtures. The transient response of liquid crystals to the application or removal of an external field was measured. The average molecular orientation following an electric field induced cholesteric-nematic phase transition was monitored by measuring the second moment of the resonance absorption line shape. The experimental data were analyzed in terms of the Leslie-Ericksen continuum theory using an effective field approximation. The frequency and time dependences of the spin-lattice relaxation in the rotating frame were determined. Dissert. Abstr.

N78-10915 Princeton Univ., N. J.
TOPICS IN CONDENSED MATTER PHYSICS: THE ROLE OF EXCHANGE IN THE LITHIUM K EDGE AND THE FLUORESCENCE SPECTRUM OF HEAVILY DOPED CADMIUM SULPHIDE Ph.D. Thesis
Steven Mark Girvin 1977 128 p
Avail: Univ. Microfilms Order No. 77-14238

The theory of X-ray thresholds was extended to include exchange effects which are found to reduce threshold exponents and increase the orthogonality index. Results of detailed numerical calculations of threshold exponents for Li are presented which differ considerably from previous values and which are in better agreement with edge data. A model was developed to explain the fluorescence spectrum of heavily doped n-type cadmium sulphide on the high density side of the metal-insulator transition. This model, based on the assumption that the impurity electrons form a metallic band, predicts a well defined upper threshold for the spectrum whose location is in good agreement with the data. The model is also consistent with the other qualitative features of the spectrum. Dissert. Abstr.

N78-10916 California Univ., Riverside.
THE KNIGHT SHIFTS AND LINEWIDTHS IN ANTIMONY POWDER Ph.D. Thesis
Alfred David Goldsmith 1975 184 p
Avail: Univ. Microfilms Order No. 77-14388

Nuclear quadrupole resonance by nuclear induction was performed at room temperature on annealed 25 micron antimony powder. A static magnetic field of about 360 gauss was applied and four transitions were observed, corresponding to the two stable isotopes of antimony and the two transitions of the quadrupole regime which have singularities in their powder pattern spectra. A theory and method was derived to analyze this data, giving the final values for the isotropic and anisotropic Knight shifts of 1.8 + or - .3% and -2.6 + or - .5% respectively. The half-intensity linewidths were also derived. The likelihood of Van

Vleck orbital paramagnetism being the dominant contributor to the Knight shifts is discussed with a theoretical order of magnitude estimate yielding 1.9% for the isotropic Knight shift. The linewidths are interpreted as being magnetic in origin.
Dissert. Abstr.

N78-10917 Wisconsin Univ., Madison.
PHONON ASSISTED ENERGY TRANSFER IN PRASEODYMIUM TRIFLUORIDE Ph.D. Thesis
Douglas Stuart Hamilton 1976 138 p
Avail: Univ. Microfilms Order No. 77-8788

A detailed investigation is presented of phonon assisted energy transfer in praseodymium trifluoride (PrF3). The excitation scan in the region of the (3H4)1-3P0 absorption indicates several satellite lines that accompany the main transition. These satellites arise from Pr(3+) ions located in unique lattice environments and point to the inhomogeneous broadening mechanism active in this crystal. Time resolved fluorescence line narrowing is used to directly observe the dynamics of both the inter-satellite line transfer as well as the transfer of excitation within the inhomogeneously broadened main transition. The dynamics of the inter-satellite line transfer are described by simple exponential rate equations with a weak dependence of the transfer rate on sample temperature. This process occurs through a 34/cm energy mismatch requiring the emission of a 34/cm phonon.
Dissert. Abstr.

N78-10918 Brown Univ., Providence, R. I.
LOW TEMPERATURE THERMAL EXPANSION OF LIQUID He4 AT MELTING Ph.D. Thesis
Henry Nicholas Hanson 1976 120 p
Avail: Univ. Microfilms Order No. 77-14126

The thermal expansion of liquid He(4) was measured along the melting curve in the temperature region 0.1-0.9K by observing the change with temperature of the resonant frequency of a superconducting microwave cavity (Q is approximately 2 x 10 to the delta power) immersed in the liquid. Relative changes in density as small as 3 x 10 to the 9th power could be resolved. From these measurements the entropy of solid He(4) can be obtained using the Clausius-Clapeyron equation in conjunction with values for the isobaric thermal expansion coefficient and entropy of the liquid calculated from other data. Above 0.4K, where the roton contribution becomes important, the thermal expansion is numerically evaluated from existing values for the Landau parameters and compared with our data. A minimum in the density near 0.7K with a depth of 27 ppm was observed. Estimates of the magnitude of the contribution to the thermal expansion from dispersion in the phonon spectra of the solid and liquid are given. Dissert. Abstr.

N78-10919 Brown Univ., Providence, R. I.
THEORY OF ALKALI CHEMISORPTION Ph.D. Thesis
Leonard Marshal Kahn 1976 132 p
Avail: Univ. Microfilms Order No. 77-14140

The linear response function in the density functional formalism is applied to alkali chemisorption on metallic surfaces. The adatom was represented by a pseudopotential perturbing the surface. Binding energies, induced dipole moments, and vibrational frequencies at the equilibrium position were calculated for the alkalis at finite coverage, as well as, in the limit of zero coverage. The theoretical results were in good agreement with experimental results. A periodic structure was introduced in the form of a pseudocharge density to represent the ionic lattice. Corrections to the quantities calculated in the jellium approximation were obtained for low index planes. Preferred adsorption sites were determined and found to be consistent with experimental findings. Computations were also performed for a high index plane where increased reactivity was observed experimentally.
Dissert. Abstr.

N78-10920 California Univ., Santa Cruz.
PARAELECTRIC RESONANCE OF THE HYDROXYL ION IN POTASSIUM IODIDE Ph.D. Thesis
William Michael Kelly 1976 163 p
Avail: Univ. Microfilms Order No. 77-13863

Paraelectric resonance (PER) in KI:OH- was investigated at frequencies from 12 GHz to 150 GHz. The data gathered confirmed the existence of an excited multiplet of energy levels 140 GHz above the ground-state multiplet. Swept-frequency results enabled a more accurate determination of some zero-field splittings and in addition produced the surprising result that the lineshape is symmetric (in frequency) at very low electric fields. Also investigated was PER in KI:OD- and an upper limit for the isotope shift of about 3% was found. This implies that OH- must lie off-center in the I- vacancy, so that the whole ion is involved in the tunneling. The upper multiplet is probably due to a center of mass vibrational mode of the OH- ion in its potential well. The shape of this well is discussed and it is shown that some asymmetry in it is sufficient to explain the difference between the dipole moments of the two multiplets. Dissert. Abstr.

N78-10921 Clark Univ., Worcester, Mass.
INVESTIGATIONS OF CRITICAL BEHAVIOR IN Ni AND Fe BY THE MOESSBAUER EFFECT Ph.D. Thesis
Mohammed Ali Kobeissi 1977 107 p
Avail: Univ. Microfilms Order No. 77-14769

The Mossbauer Effect in (57)Fe was used in experimental investigation of several topics in magnetic critical phenomena. One major focus was the study of critical fluctuations via line width broadening just above the Curie temperature, T sub c. In both Ni and Fe hosts deduced spin correlation times were found that agree with neither neutron scattering or dynamical scaling theory, yet agree well with perturbed angular correlation in Ni. A second focus of the present work was a Mossbauer study of the critical exponent beta, in Fe. The result, beta = 0.379 (4), agrees well with measurements on the other three dimensional Heisenberg systems. The isomer shift in Fe was studied near T sub c; no shift anomaly was found. There is and evidence for believing that the isomer shift depends in any way on the magnetization. Both the beta measurement and the isomer shift studies were conducted on sources rather than absorbers.
Dissert. Abstr.

N78-10922 Illinois Univ., Urbana-Champaign.
OPTICAL AND TRANSPORT STUDIES OF ATOMIC HYDROGEN AND CHALCOGEN IMPURITIES IN ALKALI METALS Ph.D. Thesis
Ralph Philip Layton 1977 185 p
Avail: Univ. Microfilms Order No. 77-14976

Atomic hydrogen and chalcogen impurities in alkali metal thin films were studied. Their optical properties were determined by transmission measurements in the vacuum ultraviolet and transport properties were probed by means of electrical resistance. The observed optical absorption and small residual resistivities of H and O indicate that these elements enter alkali metals as interstitial atoms much as in bcc transition metals. The optical spectra lack prominent features other than a very sharp peak at approximately 11.5 eV induced by the interstitial atoms in Cs. This monitor of impurity structure arises from the perturbation by the interstitial impurities of the O(2,3) core absorption edge of neighboring Cs atoms. Dissert. Abstr.

N78-10923 Massachusetts Univ., Amherst.
SATURATED SUPERFLUID He-4 FILM FLOW: THE BEHAVIOR OF ATKINS OSCILLATIONS AND THIRD SOUND IN THE PRESENCE OF PERSISTENT CURRENTS Ph.D. Thesis
Robert Kenneth Galkiewicz 1977 170 p
Avail: Univ. Microfilms Order No. 77-13813

The dynamic properties of superfluid He-4 films are investigated by persistent current flow around a loop consisting entirely of saturated film. It was found that the presence of these persistent currents modifies the character of the superfluid film oscillations. The character and magnitude of these oscillation modifications are shown to be in agreement with the theory of Campbell within the constraints imposed by experimental uncertainties and the simplified dissipation model employed in the analysis. It was also observed that third sound oscillations could be induced on the film surface by the activation of flow path heaters. Dissert. Abstr.

N78-10924 California Univ., Davis.
THE APPLICATIONS OF POINT TRANSFORMATION IN THE CALCULATIONS OF THE NONUNIFORM STATES OF LIQUID HELIUM Ph.D. Thesis
Massoud Navidi 1976 176 p

Avail: Univ. Microfilms Order No. 77-13999

A formalism based on the point-transformation method was developed to study the nonuniform states of many body systems. A coordinate transformation was chosen in such a way that the nonuniform system is transformed into a uniform system at equilibrium in the new coordinates. Since the transformation is unitary the transformed Hamiltonian K is equivalent to the Hamiltonian H in the sense that they have the same energy spectrum. The advantage of working in the new coordinates is that many properties of the system at equilibrium are known and can be used in determining the properties of the new Hamiltonian K. Dissert. Abstr.

N78-10925 Brown Univ., Providence, R. I.
AN INVESTIGATION OF DISLOCATION MOTION AND GENERATION IN LiF SINGLE CRYSTALS SUBJECTED TO PLATE IMPACT Ph.D. Thesis
Prashant Kumar 1976 122 p
Avail: Univ. Microfilms Order No. 77-14150

A plate-impact technique was used to subject a single crystal of lithium fluoride to a square pulse of duration less than 0.25 microsecond and resolved shear stress amplitude of approximately 0.05 to 0.1 GPa. Subsequent reflected waves in the crystal were minimized by use of a longitudinal momentum trap and a specially designed flyer plate shape. A laser displacement interferometer was employed to monitor the transmitted wave profile so that the stress wave loading of the crystal could be determined. An etch pit technique was used to examine changes in dislocation structure. Dislocation density was observed to increase by factors of 22 to 425. The number of dislocations generated is very strongly stress dependent, with a marked increase in dislocation generation for resolved shear stress above .08 GPa. Most of the newly generated dislocations are present in the form of glide bands. Dissert. Abstr.

N78-10926 Connecticut Univ., Storrs.
THE INFLUENCE OF ELECTRON DRAG ON DISLOCATION MOTION IN SUPERCONDUCTING NIOBIUM Ph.D. Thesis
John Harold Tregilgas 1976 75 p
Avail: Univ. Microfilms Order No. 77-14512

The temperature dependence and the magnetic field dependence of the change in flow stress were measured in a high purity bcc transition metal niobium. Results show that the change in flow stress between 2 K and 9.2 K for niobium varies in a linear manner over this temperature range. In addition to electron drag, another process which is, also, dependent on temperature affects the motion of dislocations in niobium. The field dependence of the change in flow stress between the superconducting state and mixed state for niobium was found to be proportional. This result is consistent with the field dependence of the acoustic attenuation, and implies that dislocations in niobium are moving as high velocity elastic waves. Dissert. Abstr.

N78-10927 Columbia Univ., New York.
ANALYSIS OF ROOM TEMPERATURE MILLIMETERWAVE MIXERS USING GaAs SCHOTTKY BARRIER DIODES Ph.D. Thesis
Daniel Nathan Held 1977 386 p
Avail: Univ. Microfilms Order No. 77-14811

The mechanisms responsible for the non-ideal performance of Schottky diode mixers in the vicinity of 100 GHz have been investigated and a new formal analysis procedure developed which predicts mixer performance more accurately and in substantially greater detail than previously possible. It is shown that the conversion loss and the equivalent input noise temperature of a mixer are strong functions of the diode embedding impedance at several harmonics of the local oscillator frequency and also of the diode equivalent circuit parameters. It is demonstrated that, due to skin effect, the series resistance of a diode is a function of frequency. In addition it is shown that the true value of diodes series resistance in the vicinity of 100 GHz may be twice as large as normally assumed, and accounts for approximately 1 db of the conversion loss in the mixers tested. Dissert. Abstr.

N78-10928 Polish Academy of Sciences, Warsaw.
DISLOCATION ENERGY BARRIERS IN PROCESSES OF PLASTIC METAL DEFORMATION [DYSLOKACYJNE BARIERY ENERGETYCZNE W PROCESACH DEFORMACJI PLASTYCZNEJ METALI]
Zbigniew Witczak and Janusz Klepaczko 16 Mar. 1977 39 p refs In POLISH
Avail: Issuing Activity

The following points are discussed: (1) the theory of thermically activated processes. The theory deals with both the motion of individual atoms and larger objects, such as dislocations, dislocation walls, twin crystals, boundaries of granules, and even microfissures. The rest of the article deals with only dislocation in the aspect of plastic deformation; (2) parameters of activation of the dislocation process; (3) Characteristics of dislocation barriers; (4) phenomenological description of dislocation energy barriers. (5) experimental determination of activation parameters; and (6) actual problems of thermically activated plastic flow. On the basis of the studies described herein, a general conclusion is drawn that the course of the process of thermic activation of plastic flow depends on the history of the loading, on which also depends the actual structure of the material (structural changes are reflected not only on the thermic component but also on the athermic component). Author

N78-10929*# Case Western Reserve Univ., Cleveland, Ohio.
CONVECTION ANALYSIS ON VARIOUS CRYSTAL GROWTH SYSTEMS Final Report, 15 Mar. 1976 - 15 Mar. 1977
1977 4 p refs
(Contract NAS8-31802)
(NASA-CR-150421) Avail: NTIS HC A02/MF A01 CSCL 20L

Specific work done during an indicated contract period was reviewed. An extensive survey of crystal growth literature and related topics was accomplished during this time. Specific attention was given to those areas dealing with the effects of transport phenomena on crystal growth. Critical evaluations of growth techniques were made. Techniques studied included closed tube vapor growth, open reactor vapor growth, melt growth and solution growth. Author

N78-10930# Rockwell International Science Center, Thousand Oaks, Calif.
MECHANISMS OF EXO-ELECTRON EMISSION IN STRUCTURAL MATERIALS Final Report, 1 Jan. 1974 - 31 Dec. 1976
O. Buck, W. J. Pardee, F. J. Szalkowski, and T. M. Curnow Feb. 1977 84 p refs
(Contract F44620-74-C-0043; AF Proj. 9761)
(AD-A041488; SC573.5FR; AFOSR-77-0766TR) Avail: NTIS HC A05/MF A01 CSCL 13/13

This work is aimed at understanding the origin of fatigue enhanced photostimulated exo-electron emission. The experimental part thereof is reported in the bulk of this report and the theoretical analysis in the Appendix of the report. Measurements of the photoyield of flexurally fatigued aluminum are reported as a function of photon energy for several different initial microstructures of the material; samples were prepared under well-annealed and work hardened conditions, and some were doped with small copper additions. It was found that for photon energies less than about 9 eV fatigue enhances the photoemission. It was also observed that this 'photo-stimulated exo-electron emission' is quite sensitive to the initial microstructure. The enhancement occurs much more rapidly with fatigue for well-annealed Al than for work hardened specimens. GRA

N78-10931# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
PHOTOELECTRIC AND WORK FUNCTION STUDIES OF THE Si(100)-Cs/F SURFACE Final Technical Report, 1 Jul. 1972 - 31 May 1975
F. J. Kub Wright-Patterson AFB, Ohio AFAL Apr. 1977 84 p refs
(Contract F33615-72-C-2105; AF Proj. 2001)
(AD-A042047; AFAL-TR-76-37) Avail: NTIS HC A05/MF A01 CSCL 17/5

The work function, photoelectric and structural information obtained in this experiment are combined to provide a rather complete model of the adsorption of CsF on the Si(100) surface. It is shown that a work function low enough for NEA can be achieved by CsF and Cs depositions. This is believed to be

important because it suggests the possibility of straight forward reactivation of surfaces in a sealed-off system. Author (GRA)

N78-10932# Universal Energy Systems, Inc., Dayton, Ohio.
STUDIES OF THE FACTORS AFFECTING THE THE ANALYSIS OF THIN FILMS AND SURFACES USING AUGER ELECTRON SPECTROSCOPY Final Report, 17 Dec. 1973 - 17 Dec. 1976
J. T. Grant Wright-Patterson AFB, Ohio AFML May 1977 89 p refs
(Contract F33615-74-C-4017)
(AD-A042192; AFML-TR-77-52) Avail: NTIS HC A05/MF A01 CSCL 20/8

This report describes the results of a research program undertaken to study the factors affecting the analysis of thin films and surfaces using Auger electron spectroscopy. Problems in interpreting Auger data both qualitatively and quantitatively due to overlap of spectral lines, chemical shifts in spectra, changes in spectral line shape, electron beam interactions and sample charging have been investigated and methods to overcome them have been developed. Problems that arise in depth profiling solids by inert gas ion bombardment have also been studied and techniques to improve the reliability of such measurements have also been developed. Author (GRA)

N78-10933# Wisconsin Univ., Milwaukee. Dept. of Physics.
COMPARATIVE STUDY OF ELECTRON-PHONON INTERACTION IN THREE VANADIUM SAMPLES OF VARYING PURITY Interim Report, 1 Oct. 1973 - 30 Sep. 1975
J. A. Waynert and M. Levy Jan. 1977 7 p Presented at the Intern. Conf. on Low Temperature Phys., Otaniemi, Findland, 14-20 Aug. 1975
(Grant AF-AFOSR-2079-71)
(AD-A042702; AFOSR-77-0491TR) Avail: NTIS HC A02/MF A01 CSCL 20/12

The ultrasonic attenuation coefficient has been measured in the mixed state of three samples of single crystal vanadium of varying purity in order to determine the effect of impurities on the electron phonon interaction in the mixed state of vanadium. The resistivity ratio of the three samples was 8, 245, and 400. Within experimental error the superconducting energy gap of the three samples was 3.5 kTc. The electron mean free path determined ultrasonically was 0.4, 2.1 and 0.0004 cm. respectively. A recent theory is presented which indicates that electron phonon interaction is a strong function of the electron mean free path in the mixed state. The relative attenuation decreases more rapidly for the purer samples as the magnetic field is decreased from the upper critical field and therefore the electron phonon interaction term also decreases more rapidly. There appears to be good quantitative agreement between the experimental results and the theoretical predictions. GRA

N78-10934# Harry Diamond Labs., Adelphi, Md.
RARE EARTH ION-HOST LATTICE INTERACTIONS 5: LANTHANIDES IN CaWO4
Donald E. Wortman, Clyde A. Morrison, and Nick Karayianis Jun. 1977 74 p refs
(DA Proj. 1T1-61102-AH-46)
(AD-A042210; HDL-TR-794) Avail: NTIS MF A01 CSCL 07/2

In this work, the results of calculations of energy levels and transition probabilities for the lanthanides in CaWO4 is reported. This material was one of the earlier laser host materials, and an abundance of experimental data are available, for comparison with our calculations on the energy levels and electric dipole transition probabilities for the triply ionized lanthanides from Pr to Tm. GRA

N78-10935# Harry Diamond Labs., Adelphi, Md.
RARE-EARTH ION-HOST LATTICE INTERACTIONS. 4: PREDICTING SPECTRA AND INTENSITIES OF LANTHANIDES IN CRYSTALS
Clyde A. Morrison, Nick Karayianis, and Donald E. Wortman Jun. 1977 27 p refs
(DA Proj. 1T1-61102-AH-46)
(AD-A042447; HDL-TR-1816) Avail: NTIS HC A03/MF A01 CSCL 07/2

In the first three reports of this series, a method was established for predicting the crystal field parameters, Bkm, of triply ionized lanthanides in crystals. These Bkm for even-k define the crystal field that determines the observed Stark splittings. In this report, the latest values for quantities necessary to derive the Bkm are used in an attempt to isolate the source of these large discrepancies. A new analysis using free-ion wave functions is performed on the spectra of Nd and Er in CaWO4 to determine more accurate tau factors for these ions. GRA

N78-10936# Harry Diamond Labs., Adelphi, Md.
RARE EARTH ION-HOST LATTICE INTERACTIONS. 12: LANTHANIDES IN Y3Ga5O12
Nick Karayianis, Donald E. Wortman, and Clyde A. Morrison Jul. 1977 103 p refs
(DA Proj. 1S1-61102-AH-46)
(AD-A042205; HDL-TR-1793) Avail: NTIS MF A01 CSCL 07/2

In this work phenomenological even-fold crystal field parameters, even-k B sub KM are obtained that yield least root-mean-square deviations between theoretical and previously measured energy levels for triply ionized neodymium, dysprosium, samarium, and erbium in yttrium gallium garnet, Y3Ga5O12 (YGG). A smooth set of B sub km are obtained and are used to calculate energy levels for the ground configurations for all the lanthanides in YGG by diagonalizing a parameterized D2 Hamiltonian in free-ion bases for these lanthanide ions. A D2d approximation is made and odd-k crystal field components are obtained by a sum over the YGG lattice. The D2d approximated parameters are used to calculate squared-matrix elements of the electric dipole operator between the Stark-split energy levels for the lanthanides in YGG. Author (GRA)

N78-10937# Stanford Univ., Calif. Integrated Circuits Lab.
OXIDATION AND EPITAXY
R. W. Dutton, D. A. Antoniadis, J. D. Meindl, T. I. Kamins, K. C. Saraswat, B. E. Deal, and J. D. Plummer May 1977 58 p refs
(AD-A042244; SU-TR-5021-1) Avail: NTIS HC A04/MF A01 CSCL 20/12

The first order process models for silicon epitaxy and oxidation are described. Epitaxial dopant inclusion, autodoping and transient effects are discussed, and experimental results are presented. Silicon orientation, surface doping, and ambient effects are considered for silicon-oxidation rates. Author (GRA)

N78-10938# Pennsylvania State Univ., University Park. Materials Science Lab.
TEMPERATURE COMPENSATED PIEZOELECTRIC MATERIALS Semiannual Technical Report, 1 Jan. 1975 - 31 Dec. 1976
G. R. Barsch and K. E. Spear Griffiss AFB, N.Y. RADC May 1977 39 p refs
(Contract F19628-75-C-0085; DARPA Order 2826)
(AD-A044237; RADC-TR-77-179; SATR-4) Avail: NTIS HC A03/MF A01 CSCL 20/2

In order to search for new temperature compensated materials for surface acoustic wave (SAW) devices with low ultrasonic attenuation and high electromechanical coupling, the following experimental and theoretical investigations were carried out: Extensive crystal growth investigations were carried out for beta-LiAlSiO4 (beta-eucryptite), Pb2KNb5O15, Li2SiO3, Ba2Si2TiO8, Ba2Ge2TiO8 and Bi2MoO6, using Czochralski, Bridgman or flux-pulling methods. The single crystal elastic constants, the piezoelectric constants, and the temperature derivatives of these quantities have been measured by means of the ultrasonic pulse superposition method for beta-LiAlSiO4, alpha-AlPO4 (alpha-berlinite), and Pb2KNb5O15. The direction dependence of the resonance frequency and of the ultrasonic delay time, of their temperature coefficients, and of the electromechanical coupling factor was investigated. The capability for measuring piezoelectric constants by means of X-rays has been developed. GRA

N78-10939# California Univ., Berkeley. Lawrence Berkeley Lab.
TENSILE PROPERTIES AND DEFORMATION-INDUCED TRANSFORMATIONS IN METASTABLE AUSTENITIC SINGLE CRYSTALS M.S. Thesis
G. A. Goeser Dec. 1976 63 p refs

(Contract W-7405-eng-48)
(LBL-5749) Avail: NTIS HC A04/MF A01

Single crystal tensile specimens of Fe-15Cr-15Ni (wt. percent), a metastable austenite, have been made in four different tensile orientations and strained to fracture at two temperatures between M/sub d/ and M/sub s/. The amount of transformation to strain-induced bcc martensite which proceeds concurrently with plastic strain is recorded at each orientation. The specimens tested at the lower temperature exhibit a higher strain-hardening rate and a much higher rate of transformation to martensite with strain than specimens of identical orientation strained at a temperature 80 C higher. The strain-hardening behavior of those specimens tested at the lower temperatures, with significant martensitic transformation occurring, is seen to be a combined effect of normal fcc, orientation-dependent strain-hardening behavior (as exhibited by the specimens tested at the upper temperature) and the superposition of strain-hardening behavior due to the presence of the harder martensitic phase. ERA

N78-10940# California Univ., Berkeley. Lawrence Berkeley Lab.
NONLINEAR OPTICAL EFFECTS IN LIQUID CRYSTALS Ph.D. Thesis
Erik Gregory Hanson Dec. 1976 36 p refs
(Contract W-7405-eng-48)
(LBL-6022) Avail: NTIS HC A03/MF A01

A combination of linear and nonlinear optical measurements were made on seven homologous compounds of the p prime-di-n-alkoxy-azoxybenzene series, allowing determination of the variations in these parameters with increasing alkyl chain length. The temperature dependence of the optical Kerr constant and the orientational relaxation time were measured for the isotropic phase. In the nematic phase, the temperature dependence of the refractive indices and linear birefringence of the same seven compounds were measured. Increasing alkyl chain length increases the average molecular polarizability much faster than the polarizability anisotropy. Results show that the alkyl chains do contribute to the polarizability anisotropy, but the dominant contribution is from the molecular core. A single liquid crystalline material in its isotropic phase can be used to study the entire range of self-focusing behavior from transient to quasi-steady-state. ERA

N78-10941# California Univ., Berkeley. Lawrence Berkeley Lab.
LATTICE DEFECTS IN LITHIUM FERRITE SPINEL
R. K. Mishra and G. Thomas Nov. 1976 12 p refs Presented at 6th Intern. Symp., Ceramic Microstructures 176, Berkeley, Calif., 24 Aug. 1976
(Contract W-7405-eng-48)
(LBL-5700; Conf-760856-7) Avail: NTIS HC A02/MF A01

Structural defects in as-prepared and deformed lithium ferrite spinel are studied using transmission electron microscopy. Growth type cation stacking faults and glissile dislocation on (110) planes are observed. From the measured value of the spacing between the partials 1/2(110) = 1/4(110), the cation stacking fault energy is estimated to be about 75 ergs/sq cm. ERA

N78-10942# United Kingdom Atomic Energy Authority, Culham (England). Culham Lab.
FIELD IONISATION OF LIQUID CAESIUM ON SHARP WIRES Final Report
K. L. Aitken, D. Jefferies, and R. Clampitt Jul. 1975 176 p refs
(Contract ESTEC-2050/73)
(CLM/RR/E1/21; ESA-CR(P)-864) Avail: NTIS HC A09/MF A01

The research in this report was aimed mainly at answering the following questions: Why, for wire emitters, is the current per wire so low (2 micro-amps) when Taylor cone currents are much higher (approximately 100 micro-amps)? What is the mechanism leading to ion emission, and what are the geometric parameters that control it? - In a systematic study of the I/V characteristics of needles of widely different radii of curvature, it was found that the observed ion-emission currents could only be accounted for if the apices were much sharper than when manufactured. This suggested the existence of a filamentary protrusion at the apex. Spraying experiments with liquid caesium inside the specimen chamber of a scanning electron microscope revealed the predicted cusplike protrusions. As a result of these experiments it was possible to answer the questions stated above. The point current is so low because, in the past, work had concentrated on very sharp edges or wires, which were too sharp to permit the formation and support of the liquid cusp. Hence, no cusp is formed on such wires or edges and current is limited to thin film ionisation. As regards the geometric parameters, the radius of curvature of the emitting apex or edge must exceed a particular value in order to support a cusp.
Author (ESA)

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N78-10943 Columbia Univ., New York.
THE EXPERIMENTAL CRITICAL POINT AND HIGH TEMPERATURE VAPOR PRESSURE, AND DERIVED THERMODYNAMIC PROPERTIES OF SODIUM Ph.D. Thesis
Vijay S. Bhise 1977 146 p
Avail: Univ. Microfilms Order No. 77-14781

Vapor pressure was determined experimentally for sodium from 1800 F up to the critical point. The critical pressure was determined directly as 3718.9 psia with a standard deviation of 0.09%. The value selected for the critical temperature was 4505.9 deg R which is the lowest temperature at which the critical pressure was observed. Using corresponding states, the saturated phase vapor and liquid densities up to the critical point of rubidium were re-analyzed and used to calculate the high temperature saturated phase vapor and liquid densities of sodium. The critical density of sodium, estimated in this manner, is 0.213421 g/cc with a standard deviation of 0.37%. The critical compressibility factor of sodium is calculated to be 0.1327. Additionally, the heat of vaporization and the entropy change of vaporization for sodium were calculated from 1800 F up to the critical point. Dissert. Abstr.

N78-10944 New Mexico State Univ., Las Cruces.
STOCHASTIC ELECTRODYNAMICS AND ITS RELATION TO QUANTUM THEORY Ph.D. Thesis
Phillip Richard Peterson 1977 176 p
Avail: Univ. Microfilms Order No. 77-14312

A classical hidden variable theory is investigated which is based on a classical fluctuating electromagnetic background radiation field persisting even at the absolute zero of temperature. A quantum mechanical application of the ground state model is the development of a semiclassical radiation theory where the atomic system is quantized and the radiation fields are strictly classical. The procedure adopted is that of a time dependent perturbation theory with a stochastic classical ground state. This allows a direct comparison with quantum electrodynamic first and second-order absorption, emission and scattering formulas. The major classical application of the ground state is considered in a discussion of blackbody radiation theory. Classical theory calculations are compared with the quantum electrodynamic theory of blackbody radiation fluctuations. If there is a large number of modes in a radiation bundle these two theories agree.
Dissert. Abstr.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N78-10945 Georgia Inst. of Tech., Atlanta.
QUEUEING PROCESSES WITH OPTIMIZATION BY ONE OR MORE DECISION-MAKERS Ph.D. Thesis
Borge Tilt 1976 153 p
Avail: Univ. Microfilms Order No. 77-15043

Four independent studies were undertaken: (1) characterization of queueing processes with optimization; (2) queues with decision-making by individual customers; (3) An M/M/1 queue with two users choosing arrival rates; and (4) the distribution of maximal queue length in the M/G/1 queue. A conceptual framework is developed that systematizes the various elements of decision-making relative to queues. Decision-making in queueing systems is discussed where individual customers have one or both of two options: (1) option to join or balk; (2) option to choose priority through a payment made on arrival. Following a treatment of the corresponding one-user model, the two-user model is analyzed under three different behavioral assumptions we can briefly characterize as (1) Mutual accommodation, (2) Domination, and (3) Cooperation. A simple recursive formula for calculation of the mean busy period of an M/G/1/n queue is shown. Next, it is shown that in an M/G/1 queue that starts with i customers in system, the probability that most customers will be present simultaneously during the i-busy period is calculated. Dissert. Abstr.

N78-10946*# Pepperdine Univ., Los Angeles, Calif. School of Business and Management.
WHO SHOULD CONDUCT AERONAUTICAL R AND D FOR THE FEDERAL GOVERNMENT?
H. Harvey Album Aug. 1977 219 p refs
(Grant NsG-2159)
(NASA-CR-152021) Avail: NTIS HC A10/MF A01 CSCL 05A

It was found that Government laboratories, and especially NASA laboratories, should be the prime national producers of applied research in aeronautics. American aeronautic needs the new stimulus of markedly increased outputs of broad-based innovative research from NASA laboratories more than it needs most of the technology advancement and development-oriented programs currently underway in these laboratories. The Government should use manufacturing companies for the vast bulk of development and most technology advancement. However, the Government will have to implement programs to encourage the transfer of full information on technology and research advancements, from the companies that do this work for the Government, to competing companies. Universities should be the primary sources of basic research. Service R&D companies and non-profit R&D institutions provide valuable, specialized, supplementary technical capabilities and other unique attributes, which together span the entire spectrum of aeronautical R&D. Author

N78-10947*# National Aeronautics and Space Administration, Washington, D. C.
OFFICE OF UNIVERSITY AFFAIRS MANAGEMENT INFORMATION SYSTEM: USERS GUIDE AND DOCUMENTATION
Judy Distin, Doris Goodwin, and W. A. Greene Sep. 1977 383 p refs
(NASA-TM-78422) Avail: NTIS HC A17/MF A01 CSCL 05A

Data on the NASA-University relationship are reported that encompass research in over 600 schools through several thousand grants and contracts. This user-driven system is capable of producing a variety of cyclical and query-type reports describing the total NASA-University profile. The capabilities, designed as part of the system, require a minimum of user maintenance in order to ensure system efficiency and data validity to meet the recurrent Statutory and Executive Branch information requirements as well as ad hoc inquiries from NASA general management, Congress, other Federal agencies, private sector organizations, universities and individuals. The data base contains information on each university, the individual projects and the financial details, current and historic, on all contracts and grants. Complete details are given on the system from its unique design features to the actual steps required for daily operation. Author

N78-10948# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
AIR FORCE FLIGHT DYNAMICS LABORATORY FISCAL YEAR 1978 TECHNICAL OBJECTIVE DOCUMENT
Jan. 1977 58 p Supersedes AFFDL-TR-76-18
(AD-A042363; AFFDL-TR-77-33) Avail: NTIS HC A04/MF A01 CSCL 01/3

The document presents an overview of the four Technical Planning Objectives and supporting data for each. These are extracted from the technical plan of the Air Force Flight Dynamics Laboratory (AFFDL). Information is largely based on AFFDL fiscal 1978 technology plan omitting specific funding and timing information of an 'Official Use Only' nature. Technical objectives are described for the technical areas of Structural Mechanics, Vehicle Equipment/Subsystems, Flight Control and Aeromechanics. Points of contact for more information in each of the areas are identified. Author (GRA)

N78-10949# Office of the Project Manager Selected Ammunition, Dover, N. J.
A COMPUTER PROGRAM FOR TRACKING COST/SCHEDULE CONTROL SYSTEMS CRITERIA Final Report
Louis M. Smith Jun. 1977 98 p refs
(AD-A042314; PMSA-2-5) Avail: NTIS MF A01 CSCL 14/1

Report describes a computer program that provides a means for tracking contractor's performance where Cost/Schedule Control Systems Criteria are utilized. The program was specifically designed for the CDC 6500/6600 computer at USA Armament Research and Development Command, Dover, N.J. Input data are those normally found in a contractor's Cost Performance Report. Program output is a series of Cost and Schedule Performance Index graphs, a summary variance graph, and a set of tables. Author (GRA)

N78-10950# Defense Systems Management School, Fort Belvoir, Va.
CLASS V MODIFICATION MANAGEMENT AND PLANNING: A GUIDE FOR THE AFSC PROGRAM MANAGER OF LESS-THAN-MAJOR SYSTEMS
Reginald M. Cilvik May 1977 62 p refs
(AD-A042941) Avail: NTIS HC A04/MF A01 CSCL 05/1

The primary goal of the report is to provide the AFSC program manager (PM) of less-than-major systems with an understanding of the importance of the early planning interface required between the AFSC PM, AFLC agencies, and higher headquarters; and the impact of the PM in the implementation of Class V modifications. The author first summarizes the current DOD and Air Force documentation which provides data for basic authority and establishes policies for Class V modifications. He outlines typical interfaces between the AFSC program office, AFLC agencies, and HQ USAF that are required for AFLC-managed Class V modifications. Next, he provides a brief overview of the DOD Planning Programming, and Budgeting System (PPBS) and illustrates the importance of lead timing for the modification budget submission within PPBS. The different procurement appropriations, Class V modification budget program monies, and planning documentation are summarized. Problem areas in modification management are discussed, based on interviews with AFSC and AFLC personnel. General guidelines are established to assist the AFSC PM to accomplish his program more effectively through better understanding of the Class V modification process. Such improved understanding should facilitate the transition from an RDT/E program to a Class V modification program. GRA

N78-10951# Defense Systems Management School, Fort Belvoir, Va.
USING COST ANALYSIS TO BREAK THE OVERRUN HABIT
Richard William Grimm May 1977 100 p
(AD-A042935) Avail: NTIS HC A05/MF A01 CSCL 14/1

This report is a treatise on cost analysis and cost management intended primarily to orient personnel unfamiliar with them. Major factors contributing to program cost problems are highlighted. The results of several studies on cost growth are portrayed, and several recommendations are made for controlling cost. Cost

analysis responsibilities and methodology are presented in detail and examples are used. Parametric methodology is emphasized heavily as this is the government's primary technique. Analytical and institutional problems are discussed and on-going research to solve them is described. The report closes with a discussion of how the program director and cost analysts can work together to help break the overrun habit. Author (GRA)

N78-10952# Defense Systems Management School, Fort Belvoir, Va.
GRAPHICAL EVALUATION AND REVIEW TECHNIQUE (GERT): A STOCHASTIC NETWORKING SCHEME FOR SYSTEMS ACQUISITION MANAGEMENT
Earle Howard Helgerson May 1977 67 p refs
(AD-A042934) Avail: NTIS HC A04/MF A01 CSCL 05/1

This study is designed to acquaint members of the Defense Systems Acquisition Management Community with the fundamental operating characteristics of a stochastic networking simulation scheme known as GERT (Graphical Evaluation Review Technique). The development of GERT has been structured around a conceptual framework supported principally by the PERT networking technique. Primarily geared to satisfying management needs, the evolution of GERT demands a minimum amount of technical expertise necessary to comprehend the fundamental concepts. The principal theme of the study evolves about the ability of GERT to accommodate the realities associated with uncertainty, risk and variability which clearly separates it from the classical critical path networking models. Supporting this notion, the study discusses the stochastic realities that the DOD Program Manager must contend with on a daily basis. GRA

N78-10953# Bureau of the Census, Suitland, Md. Budget Div.
SUPPLIES INVENTORY, USER'S GUIDE
Apr. 1977 50 p
(PB-269609/4; CEN/DF-77/004a) Avail: NTIS
HC A03/MF A01 CSCL 05A

A program is described for updating the consumable stock item inventory on a semi-monthly basis. The input is the receipt documents from vendors and the issue documents showing transfer of stock items to the open stock room and to specific divisions. During the update process the remaining balance on hand of each stock item is checked against a predetermined minimum balance and if quantity is less than the minimum balance, an order is automatically prepared. An undelivered order record for input to the accounting system is prepared whenever an order is placed. Charges for supplies used by each division are prepared during this process and entered into the accounting system monthly. GRA

N78-10954# Synergy, Inc., Washington, D. C.
JOINT ALUMINUM/COPPER FORECASTING AND SIMULATION MODEL Final Report
Jun. 1977 136 p
(Contract DI-BM-J0-155167)
(PB-270380/9; BM-OFR-114(1)-77) Avail: NTIS
HC A07/MF A01; HC also available in set of 3 reports as PB-27379-SET, HC E10 CSCL 08I

A worldwide simulation model of aluminum and copper was developed that describes the interaction between the two markets. The model provides a tool for base market forecasting and for analyzing the implications of alternative market conditions. The model specification is dynamic and based on both economic theory and our understanding of the operation of the copper and aluminum markets. The demand side began with an examination of the utility theory and it deals exhaustively with substitutability and consumer choice. For each metal, demand is disaggreated regionally and, within the United States, on a consuming industry basis. The regional demand for each metal equation is specified for total United States, Europe, Japan, and total-free-world. GRA

N78-10955# Synergy, Inc., Washington, D. C.
JOINT ALUMINUM/COPPER FORECASTING AND SIMULATION MODEL APPENDICES C, D, E, F, G, H, AND I Final Report
Jun. 1977 186 p
(Contract DI-BM-J0-155167)
(PB-270382/5; BM-OFR-114(3)-77) Avail: NTIS
HC A09/MF A01; HC also available in set of 3 report as PB-270379-SET, HC E10 CSCL 08I

The contents of part 3 are as follows: Appendix C-Empirical Implementation of Various Demand and Supply Specifications, Appendix D-Summary of Estimation Procedures, Appendix E-Elasticties in Simultaneous Equation Models, Appendix F-Documentation of Simulation Procedure and Program, Appendix G-Simulation and Forecasting Results of the Aluminum/Copper Model, Appendix H-Potential Use of BOM's Minerals Availability System (MAS) in Econometric Models, and Appendix I-Specifications of Price Effects in Consumer Demand Equations. GRA

N78-10956# Synergy, Inc., Washington, D. C.
JOINT ALUMINUM/COPPER FORECASTING AND SIMULATION MODEL, APPENDICES A AND B Final Report
Jun. 1977 156 p
(Contract DI-BM-J0-155167)
(PB-270381/7; BM-OFR-114(2)-77) Avail: NTIS
HC A08/MF A01; HC also available in set of 3 reports as PB-270379-SET, HC E10 CSCL 08I

The contents of part 2 include: Appendix A-Copper and Aluminum Cost Variables, and Appendix B-Aluminum/Copper Data Bank. GRA

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N78-10957 Houston Univ., Tex.
A PILOT SYSTEM FOR THE TEXAS ENERGY DATA BANK AND INFORMATION RETRIEVAL SYSTEM Ph.D. Thesis
Daniel Velaire Goulet 1976 511 p
Avail: Univ. Microfilms Order No. 77-13633

An energy data base for the State of Texas was developed. The Texas Energy Data Bank and Information Retrieval System (TEDBIRS) is a pilot system which consists of a data management system capable of handling time series data, a user language, and a prototype data base. The data management system consists of 16 subroutines which initialize and update all time series data to the system. The user language consists of a retrieve command, 22 analysis commands, 2 documentation commands all written in FORTRAN 4. The command structure uses simple language and syntax. The language is capable of simple extension, making it very responsive to the user's needs. The prototype data base consists of 69 energy data vectors for the State of Texas over a 22 year period. Dissert. Abstr.

N78-10958# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
DESIGNING A RULE SYSTEM THAT SEARCHES FOR SCIENTIFIC DISCOVERIES Interim Report
Douglas B. Lenat and Gregory Harris Apr. 1977 31 p refs
(Contract F44620-73-C-0074)
(AD-A042157; AFOSR-77-0826TR) Avail: NTIS
HC A03/MF A01 CSCL 09/4

Some scientific inference tasks (including mass spectrum identification medical diagnosis, and math theory development have been successfully modelled as rule-directed search processes. These rule systems are designed quite differently from 'pure production systems'. By concentrating upon the design of one program (AM), we shall show how 13 kinds of design deviations arise from the level of sophistication of the task that the system is designed to perform, the inherent nature of the task, and the designer's view of the task. The limitations of AM suggest even more radical departures from traditional rule system architecture. All these modifications are then collected into a new, complicated set of constraints on the form of the data structures, the rules, the interpreter, and the distribution of knowledge between rules, and data structures. These new policies sacrifice uniformity in the interests of clarity, efficiency and power derivable from a

thorough characterization of the task. Rule systems whose architectures conform to the new design principles will be more awkward for many tasks than would 'pure' systems. Nevertheless, the new architecture should be significantly more powerful and natural for building rule systems that do scientific discovery tasks. GRA

N78-10959# Ames Lab., Iowa.
OPERATION AND MAINTENANCE OF THE RARE-EARTH INFORMATION CENTER'S INFORMATION RETRIEVAL SYSTEM (RICIRS), VERSION 2
Jan. 1977 38 p refs
(Contract W-7405-eng-82)
(IS-4104) Avail: NTIS HC A03/MF A01

The RICIRS system is a key word-based retrieval system capable of retrieving bibliographic information from a direct access device. The constructing of retrieval requests and the updating of the data bases for the information retrieval system is described. The system is written for an IBM 360-370 OSMVT environment. It is written in PL/I optimized codes. ERA

N78-10960# California Univ., Livermore. Lawrence Livermore Lab.
SET THEORETIC DATA STRUCTURES (STDS): A TUTORIAL
E. W. Birss and Jeffry W. Yeh 31 Jan. 1977 52 p refs
(Contract W-7405-eng-48)
(UCID-17378) Avail: NTIS HC A04/MF A01

A data base system called Set Theoretic Data Structures (STDS) is shown to be similar to relational algebraic data base management systems. The advantages of STDS are its straightforward data base design, compact data representation, and flexible, powerful data manipulation operators, while its limitations are its low-level primitive user interface and the partial implementation of the extended set theoretic concepts. To make STDS very attractive, a user-friendly interface should be developed, and some distinctive features of extended set theory (such as sets of sets) should be implemented. ERA

N78-10961# European Space Research and Technology Center, Noordwijk (Netherlands). Structures and Thermal Control Div.
REQUIREMENTS FOR THE WRITING OF PROCESSING PROCEDURES
Paris ESA 1 Jan. 1977 15 p
(ESA-PSS-30-Issue-1) Avail: NTIS HC A02/MF A01

The requirements for the writing of processing procedures, including the definition of necessary processing parameters and conditions, the codification of the process itself, and the recording and management data are presented. Author (ESA)

N78-10962# Battelle Columbus Labs., Ohio.
DEVELOPMENT AND ASSESSMENT OF SCENARIOS FOR THE SCIENTIFIC AND TECHNICAL INFORMATION SEARCH SYSTEM OF THE FUTURE: EXECUTIVE SUMMARY Final Report
25 Apr. 1977 36 p 2 Vol.
(Contract NSF C-76-05501)
(PB-268711/9) Avail: NTIS HC A03/MF A01 CSCL 05B

Scenarios for the STI search system of the future were developed. Each assumes different combinations of levels of the environmental parameters: (1) technology utilization; (2) information priority; and (3) competition. The resulting scenarios portray futures ranging from highly advanced technology-oriented systems to systems showing little technological progress with even deterioration of current levels of services. From the assessments it is indicated that information priority is the dominating environmental parameter. Conclusions and recommendations are given. GRA

N78-10963# Battelle Columbus Labs., Ohio.
DEVELOPMENT AND ASSESSMENT OF SCENARIOS FOR THE SCIENTIFIC AND TECHNICAL INFORMATION SEARCH SYSTEM OF THE FUTURE Final Report
25 Apr. 1977 187 p refs 2 Vol.
(Contract NSF C-76-05501)
(PB-268712/7) Avail: NTIS HC A09/MF A01 CSCL 05B

The scenarios, in general, look to the 1985 time period. An organized and comparative assessment of the scenarios provide a close look at the technical, economic, and socio-political aspects. The principal barriers to continued improvement are disclosed through this assessment process. The significant impact on the STI search system by developments in other segments of the society is also emphasized in the assessments. Areas where needs for new or continued research were identified in the development and assessment of the scenarios are detailed. GRA

N78-10964# Exxon Research and Engineering Co., Linden, N. J. Government Research Labs.
USER VALUES IN THE SELECTION OF INFORMATION SERVICES Final Report, 30 Jun. 1975 - 30 Sep. 1976
Homer Hall 15 Feb. 1977 83 p refs
(Contract NSF C-1027)
(PB-269507/0; EXXON/GRU.1DK.77) Avail: NTIS HC A05/MF A01 CSCL 05B

Selection variables are summarized in a matrix of user values and interaction effects. The research function user prefers original documents, and tends to choose subjectively. The operating manager often stops with abstracts and emphasizes quantifiable factors. The planning manager wants a digest of ideas, and tends to judge a service first as to its reliability. These three functions attach entirely different connotations to the same words for key parameters. Apparent conflicts may be resolved by dimensional analysis of differences in values perceived as illustrated by case histories, interviews, and questionnaire results. GRA

N78-10965# Denver Research Inst., Colo. Knowledge Utilization Program.
INFORMATION AND DATA FLOWS IN SOCIETAL PROBLEM AREAS: FOCUS-ENERGY Final Report
James E. Freeman, J. P. Kottenstette, and P. M. Gatseos May 1977 68 p refs
(Grant NSF SIS-74-19324)
(PB-269497/4; KNUTAP-5211-01-FR) Avail: NTIS HC A04/MF A01 CSCL 05B

The problem of how scientific and technical information and data (STID) flow from research into decision making was addressed in efforts to solve important societal problems. Two case studies of STID flows in the area of energy provide an empirical base for the study. Orientation and definitions are presented as well as how three emerging social values energy sufficiency, environmental protection, and citizen participation are increasingly shaping energy decision in the United States. A typology of energy STID flows is reviewed along with a set of eight key questions that administrators can use to determine the adequacy of information transfer arrangements supporting energy problem solving. Author

N78-10966# National Library of Medicine, Bethesda, Md.
MEDICAL SUBJECT HEADINGS, TREE STRUCTURES, 1978
Jul. 1977 425 p
(PB-270945/9; NLM-MED-77-03) Avail: NTIS HC A18/MF A01 CSCL 05B

All medical subject headings currently in use by the indexers, catalogers, and searchers of the National Library of Medicine are arranged in a hierarchical manner showing relationships between broader and narrower terms. Included are minor and geographic descriptors. GRA

N78-10967# National Library of Medicine, Bethesda, Md.
MEDICAL SUBJECT HEADINGS, ANNOTATED ALPHABETIC LIST, 1978
Jul. 1977 679 p
(PB-270894/9; NLM-MED-77-02) Avail: NTIS HC A99/MF A01 CSCL 05B

This list is an expanded version of MeSH that is adapted to the needs of indexers, catalogers, and of persons searching the NLM computer data bases. Its use is strongly recommended to all MEDLINE users. The annotations were written by indexers and catalogers primarily for the needs of indexers and catalogers. However, some of the information contained in the annotations is introduced specifically for the MEDLINE user. GRA

N78-10968*# General Accounting Office, Washington, D. C. Procurement and Systems Acquisition Div.
LANDSATS ROLE IN AN EARTH RESOURCES INFORMA-

TION SYSTEM: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. OFFICE OF SCIENCE AND TECHNOLOGY POLICY
10 Jun. 1977 47 p Sponsored in part by NASA
(NASA-CR-155217; PB-269456/0; PSAD-77-58) Avail: NTIS HC A03/MF A01 CSCL 05B

The need for a clear statement of government policy regarding support of an operational LANDSAT system is discussed. Conclusions and recommendations are given which will allow congress and the executive branch to have a better understanding to reach a decision. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N78-10969 Georgia Inst. of Tech., Atlanta.
UNCERTAINTY RESOLUTION IN MULTI-STAGE CAPITAL BUDGETING PROBLEMS Ph.D. Thesis
Chan Seok Park 1977 282 p
Avail: Univ. Microfilms Order No. 77-15046

The manner in which uncertainty is expected to be resolved over time in the capital rationing context was examined. Different elements of information regarding the desirability of a proposal were discussed. These were the negative project balance, the discounted payback period, the area of positive balance and the terminal profitability of the proposal. Interrelationships of these four along with the expected gain confidence criterion and the project balance criterion were explored. Dissert. Abstr.

N78-10970# Naval Surface Weapons Center, Dahlgren, Va.
COMPUTER MODEL FOR LIFE CYCLE COSTING. USER'S GUIDE
Wayne McLaughlin May 1977 55 p refs
(AD-A042405; NSWC/DL-TR-3645) Avail: NTIS HC A04/MF A01 CSCL 05/1

This report provides instructions for operating the computer program which models life cycle costs for equipment acquisitions. The program, written in the FORTRAN IV Extended programming language, was implemented on the CDC 6700 computer under the SCOPE 3.4 operating system at the Naval Surface Weapons Center, Dahlgren, Virginia, in January, 1977. Designed for use from an intercom terminal in an interactive manner, the model has a wide variety of built in capabilities which can greatly facilitate the task of performing life cycle cost analysis. A detailed discussion concerning the use of each feature is presented. This is then expanded into an overall description of the program's operating sequence, to aid the potential user in ascertaining if the model can be used to meet his specific needs. The remainder of the report is devoted to the actual operation of the program. Execution involves the sequential display of requests by the terminal for input, followed by responses typed by the operator. Thorough coverage is given to the choices available to the user in each situation, including examples of input and output.
Author (GRA)

N78-10971# Cornell Univ., Ithaca, N. Y. School of Maximum and Industrial Engineering.
OPTIMAL ASYMPTOTIC PROPERTIES OF MAXIMUM LIKELIHOOD ESTIMATORS OF PARAMETERS OF SOME ECONOMETRIC MODELS
Mary Kathleen Vickers May 1977 149 p refs
(Contract DAAG29-73-C-0008; N00014-75-C-0586)
(AD-A042592; TR-334) Avail: NTIS HC A07/MF A01 CSCL 05/3

Four theorems are proven, which simplify the application to econometric models of Weiss's theorem on asymptotic properties of maximum likelihood estimators in nonstandard cases. The theorems require, roughly: the uniform convergence in any compact sets of the unknown parameters of the expectation of the Hessian matrix of the log likelihood function; and the uniform convergence to 0 in the same sense of the variance of the same quantities. The fourth theorem allows one to conclude that the optimal properties hold on an image set of the parameters when the map satisfies certain smoothness conditions, and the first three theorems are satisfied for the original parameter set. These four theorems are applied to autoregressive models, nonlinear models, systems of equations, and probit and logit models to infer optimal asymptotic properties. Author (GRA)

N78-10972# George Washington Univ., Washington, D. C. Inst. for Management Science and Engineering.
A REEXAMINATION OF THE ADAPTIVE EXPECTATIONS HYPOTHESIS WHEN APPLIED TO A COBWEB MODEL
Barry D. Nussbaum and Nozer D. Singpurwalla 31 May 1977 16 p refs
(Contract N00014-75-C-0729)
(AD-A042738; SERIAL-T-355) Avail: NTIS HC A02/MF A01 CSCL 05/3

This note points out a certain type of inconsistency which appears when the familiar adaptive expectations hypothesis is applied to the supply equation of a basic cobweb model with a simple error structure. It is shown that there is a difference between the minimum mean square error forecast function of the price (when the price is viewed as a stationary time series process) and the implicit assumption of the adaptive expectations hypothesis. The inconsistency disappears when a certain condition is satisfied by the model parameters. Thus, for a cobweb model with an error structure, the parameter space in which the adaptive expectations hypothesis is meaningful is diminished. GRA

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N78-10973*# Rockwell International Corp., Downey, Calif. Space Div.
INDUSTRIES IN SPACE TO BENEFIT MANKIND: A VIEW OVER THE NEXT 30 YEARS
[1977] 37 p Original contains color illustrations
(Contract NAS8-32198)
(NASA-CR-155203; SD-77-AP-0094) Avail: NTIS HC A03/MF A01 CSCL 05B

New products, services, and energy sources are available to man through the exploitation of the useful attributes of space and space shuttle operations. Benefits include: (1) industrial fuel conservation through the use of electronic teleconferencing, high temperature turbines, and the space processing of materials; (2) improved health care through the use of biotelemetry, teleoperators, and weightless hospitals; (3) more efficient communication systems such as portable telephones, individual warning devices, and direct satellite broadcasting for educational purposes; (4) more abundant crop growth and controlled climate modification by the use of space-based reflectors to direct the light of the sun and moon to specific areas on earth; (5) solar energy utilization; and (6) reduction in radiation hazards through the use of space-based nuclear fusion reactors. A.R.H.

N78-10974# General Accounting Office, Washington, D. C. Community and Economic Development Div.
CONTINUING NEED FOR IMPROVED OPERATION AND MAINTENANCE OF MUNICIPAL WASTE TREATMENT

PLANTS: ENVIRONMENTAL PROTECTION AGENCY
11 Apr. 1977 83 p
(PB-268807/5; CED-77-46) Avail: NTIS HC A05/MF A01 CSCL 13B

Widespread operations and maintenance problems at 28 municipal waste treatment plants constructed with federal grants were studied. Inefficient plant operations are caused by and noted: (1) insufficient qualified plant-operating personnel; (2) inadequate budgets; (3) inadequate controls over industrial waste; (4) inadequate laboratory controls; (5) inadequate plant design and equipment; and (6) infiltration/inflow problems. GRA

N78-10975# World Future Society, Washington, D. C.
RESOURCES DIRECTORY FOR AMERICA'S THIRD CENTURY. PART 1: AN INTRODUCTION TO THE STUDY OF THE FUTURE Final Report
Jan. 1977 411 p
(Grant NSF OSS-75-01241-A01)
(PB-269949/4; NSF/OGPP-76/1; LC-76-52074) Avail: NTIS HC A18/MF A01 CSCL 05F

The following aspects of future study are discussed: an introduction to the field of futures research; the background and evolution of the field; an explanation of the breadth of the field of futures research through a detailed description of particular individual leaders in the field as well as specific leading institutions active in the field; a taxonomy of futures research, using methods of analytical or scientific methodology as one of the criteria; a summary of the state of the art of futures research; a glossary of terms, and a section on major methods and techniques used in futures research. GRA

N78-10976# World Future Society, Washington, D. C.
RESOURCES DIRECTORY FOR AMERICA'S THIRD CENTURY. PART 2: INFORMATION SOURCES FOR THE STUDY OF THE FUTURE Final Report
Jan. 1977 340 p
(Grant NSF OSS-75-01241-A01)
(PB-269950/2; NSF/OGPP-76/2; LC-76-52073) Avail: NTIS HC A15/MF A01 CSCL 05F

Information is given regarding: (1) futures research resources and geographic location; (2) futures research bibliography of contemporary works; (3) a listing of repositories of relevant information on futures research, educational materials relevant to futures research; and (4) a selective listing of educational programs in the field of futures research offered by U.S. colleges and universities. GRA

N78-10977# Delaware Univ., Newark. Dept. of Civil Engineering.
PROCESS SELECTION FOR OPTIMAL MANAGEMENT OF REGIONAL WASTEWATER RESIDUALS Annual Report
Richard I. Dick, David L. Simmons, Roy O. Ball, and Kimm Perlin Oct. 1976 273 p refs
(Grant NSF ENV-75-15751-A01)
(PB-269572/4; NSF/RA-760570) Avail: NTIS HC A12/MF A01 CSCL 13B

Progress in developing a framework for rational integration of processes involved in treatment, reclamation, and disposal of municipal sludge is reported. The performance of sludge treatment processes as functions of basic sludge properties and design and operation variables were modeled, and equations describing the costs of sludge treatment processes as functions of basic design variables were used. A digital computer and optimization procedures were employed to explore optimal integration of processes and to consider effects of sludge properties and design and operation strategies on sludge management. GRA

N78-10978# Metropolitan Denver Sewage Disposal District No. 1, Commerce City, Colo.
COMPREHENSIVE SUMMARY OF SLUDGE DISPOSAL RECYCLING HISTORY Final Report, 1967 - 1974
John C. Baxter, William J. Martin, Burns R. Sabey (Colorado State Univ.), William E. Hart (Colorado State Univ.), and David B. Cohen Apr. 1977 97 p refs
(Contract EPA-68-03-2064)
(PB-269352/1; EPA-600/2-77-054) Avail: NTIS HC A05/MF A01 CSCL 13B

Methods for and problems associated with the application of sludge to the soil in the Denver district are discussed. Continuous applications since 1969 have raised the concentration of nutrients, heavy metals, salts, and organic matter. The effects of various sludge applications to soil on germination, emergence, subsequent plant growth, and uptake of heavy metals are examined. Microbial counts of fecal coliform bacteria in sludged plots showed no appreciable differences from control plots after a 6 month incubation period. Liquid sludge added to shallow earthen drying basins demonstrated that water is lost through soil percolation in addition to evaporation, and that about half the N nitrogen content of sludge is lost. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N78-10979 Columbia Univ., New York.
PULSAR MAGNETOSPHERES AND EMISSION MECHANISMS Ph.D. Thesis
Andrew Francis Cheng 1977 118 p
Avail: Univ. Microfilms Order No. 77-14788

An electron-positron pair plasma is created above a positively charged polar cap, in various models for ion flow out of the neutron star surface and for various pair production discharge mechanisms. A potential drop may arise above a pulsar polar cap either from the inertia of freely released ions in a space charge limited flow, or from surface binding of ions leading to charge depletion and gap formation. Pair production discharges which limit this potential drop may arise from Sturrock-Goldreich discharges with pair creation in the stellar magnetic field, or from pair production by thermal X-rays from the polar cap surface in the Coulomb field of relativistic ions or electrons and positrons accelerated through the discharge regions. In all cases the properties of the resulting electron-positron pair plasma are similar, except that the number density is less when the ion flow is space charge limited. Dissert. Abstr.

N78-10980 Wisconsin Univ., Madison.
AN OBSERVATIONAL STUDY OF THE PRE-MAIN SEQUENCE HERBIG AE/BE STARS Ph.D. Thesis
Loring Milliken Garrison, Jr. 1976 138 p
Avail: Univ. Microfilms Order No. 77-8785

Visual and near infrared spectrophotometry, UBVR H alpha polarimetry, and high resolution H alpha echelle spectrograms were obtained for a large sample of the pre-main sequence Herbig Ae/Be stars. The spectral energy distributions showed smaller than normal Balmer jumps and small execesses in the near infrared. A model of optically thin free-bound and free-free emission from circumstellar regions accounts for both the Balmer and infrared excesses. Emission measures were derived which yield estimates for mass loss rates. Several methods were used to remove the interstellar component of polarization, and derived intrinsic polarizations were similar to those of normal emission line stars. Variability and morphology of the polarization are discussed. Many dissimilar H alpha line profiles are examined and shown to be optically thick. Dissert. Abstr.

N78-10981 Massachusetts Univ., Amherst.
ON WHITE DWARF MODELS OF VARIABLE COMPACT X-RAY SOURCES Ph.D. Thesis
Paul Donald Guthrie 1977 96 p
Avail: Univ. Microfilms Order No. 77-13816

An expression for the opacity-limited luminosity of white dwarf stars, which undergo Roche lobe mass transfer during

their evolution was developed. A method was studied for computing the luminosity and spectrum of the X-ray emission from shocked gas at a given shock velocity. The equation of motion of the shell was developed. Two asymptotic limits were defined; that in which gravity dominates and that in which the ram pressure dominates. These were solved analytically and the general equation of motion was solved numerically. Equilibrium conditions were obtained for the analytic solutions. It was concluded that some white dwarfs in binaries should undergo subnova detonations during accretion, and should thus become X-ray sources. Dissert. Abstr.

N78-10982 Johns Hopkins Univ., Baltimore, Md.
CHROMOSPHERES OF K-TYPE STARS AND LOCAL INTERSTELLAR MATTER Ph.D. Thesis
William Edward McClintock 1977 476 p
Avil: Univ. Microfilms Order No. 77-15081

High spectral resolution ultraviolet and visible observations of chromospheric emission lines in K-type stars were made. Measurements of L alpha, the Mg (II) lambda 2800 resonance doublet, and upper limits on emission line intensities from ionized metals were made. Ground based measurements of the Ca (II) K line in alpha Tau were obtained. Observations of L alpha emission in the nearby main sequence K star epsilon Eri set limits on the velocity, the velocity dispersions, and the densities of atomic hydrogen and deuterium in the local interstellar medium. Surface fluxes and profiles of L alpha in five stars and Mg (II) in seven stars were compared. The surface fluxes of both were an order of magnitude greater than those in giants and supergiants. These results are consistent with an analysis of the Ca (II) K line intensities in late type stars. Dissert. Abstr.

N78-10983*# Santa Barbara Research Center, Goleta, Calif.
DEVELOPMENT OF DOPED-GERMANIUM PHOTOCONDUCTORS FOR ASTRONOMICAL OBSERVATIONS AT WAVELENGTHS FROM 30 TO 120 MICROMETERS Final Technical Report, 1 Oct. 1976 - 31 Mar. 1977
P. R. Bratt and N. N. Lewis 31 Oct. 1976 78 p
(Contract NAS2-9385)
(NASA-CR-152046) Avail: NTIS HC A05/MF A01 CSCL 03A

Technology was developed for production of doped-germanium detectors which have optimized performance in the 30- to 120-micrometer wavelength range and are capable of achieving the objectives of the Infrared Astronomy Satellite space mission. The work of this phase was divided into the following major tasks: (1) growth of Ge:Ga crystals from high-purity starting material with Ga concentrations different from that previously produced, and development of a zone leveling method to produce a uniform Ga doping concentration; (2) growth of uncompensated Ge:Be crystals from high-purity starting material with a range of Be concentrations between 10 to the 14th power and 10 to the 16th power atoms/cubic cm; (3) evaluation of crystals by means of Hall effect and resistance measurements as a function of temperature; (4) fabrication and test of detectors made from both Ge:Be and Ge:Ga crystals to determine the relative performance between different crystals. Correlation of detector test data with material evaluation data and analysis of how to further optimize detector performance. Author

N78-10984# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ONE HUNDRED AND EIGHT ECLIPSING VARIABLES IN THE MAGELLANIC CLOUDS
Sergei I. Gaposhkin 12 Sep. 1977 31 p refs
(SAO-Special-Rept-380) Avail: NTIS HC A02/MF A01

The light curves of seventy-five eclipsing variables of the Large Magellanic Cloud and thirty-three of the Small Magellanic Cloud are presented in tables. The data were obtained from a study of more than three million photographic observations over a seventy-five year period. Author

N78-10142*# Air Force Geophysics Lab., Hanscom AFB, Mass.
ANALYSIS OF PENUMBRAL ECLIPSE DATA
H. B. Garrett *In* NASA. Lewis Res. Center Proc. of the Spacecraft Charging Technol. Conf. 24 Feb. 1977 p 191-201 refs (For availability see N78-10129 01-12)
Avail: NTIS HC A99/MF A01 CSCL 03A

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N78-10985 Wisconsin Univ., Madison.
SPATIAL CORRELATIONS AND SPECTRAL CHARACTERISTICS OF THE SOFT X-RAY DIFFUSE BACKGROUND Ph.D. Thesis
Wilton Turner Sanders, III 1976 146 p
Avail: Univ. Microfilms Order No. 77-8115

Soft X-ray maps in three broad energy bands are presented for a region covering approximately 1/10 of the sky south of the galactic plane near the galactic anticenter. A C band map of the southern galactic hemisphere is presented also. The spatial variations of C band intensity are examined for correlations with other astronomical data. Away from the galactic plane, C band intensity tends to increase where neutral hydrogen decreases; C band intensity tends to be large towards stars with large column densities of OVI; radio continuum intensity tends to be low where C band intensity is high. Dissert. Abstr.

N78-10986 Arizona Univ., Tucson.
ICE MANTLES, AND THE SIZE OF INTERSTELLAR GRAINS Ph.D. Thesis
Daniel Howard Harris 1976 131 p
Avail: Univ. Microfilms Order No. 77-15336

Large R (congruent to A(V)/E(BV)) variations calculated using the cluster diameter method were examined. Infrared photometry of 11 strongly obscured stars showed that near rho Oph the extinction was distinctive with a large R value and inferred large grain size. For A(V) <25 mag there was little or no ice band extinction, yet for the more heavily obscured stars the ice extinction to E(HK) ratio was approximately 0.30. There was a dichotomy in ice band strength at an onset local dust density of 5 mag/pc in E(HK). A model assuming silicate core grains and cosmic abundances showed that below the onset density the observed ice extinction was approximately 350 times less than the expected maximum and that above the onset density it was approximately 30 times less than the expected maximum. Dissert. Abstr.

N78-10987 Arizona Univ., Tucson.
THE NATURE OF HEAVY-ELEMENT ABUNDANCE GRADIENTS IN GALAXIES Ph.D. Thesis
Eric Bruce Jensen 1977 140 p
Avail: Univ. Microfilms Order No. 77-15340

A density-wave theory was developed to investigate star formation in the arms of spiral galaxies and the relation of radial changes in disk gas chemical composition to variations in the star-forming frequency and star-formation efficiency across the face of a galaxy. Emission-line gradients in the disks of 12 late spiral galaxies were found to be consistent with what would be expected if much of the star formation that has produced the heavy elements in the gas has proceeded in density-wave spiral arms. The radial distribution of current star formation in M101 appears to be consistent with the hypothesis that the star formation is a consequence of a density-wave-driven shock. The total current star formation in M101 is not greatly less than the average rate needed to produce the old stellar disk in M101 in 10 billion years. Surface density fluctuations of the old disk component account for most of the light in the observed spiral structure. Dissert. Abstr.

N78-10988*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ORBIT DETERMINATION ACCURACIES USING SATELLITE-TO-SATELLITE TRACKING
F. O. Vonbun, P. D. Argentiero, and P. E. Schmid Oct. 1977 38 p refs Submitted for publication
(NASA-TM-X-71408; X-931-77-189) Avail: NTIS HC A03/MF A01 CSCL 03B

The uncertainty in relay satellite sate is a significant error source which cannot be ignored in the reduction of satellite-to-satellite tracking data. Based on simulations and real data reductions, it is numerically impractical to use simultaneous unconstrained solutions to determine both relay and user satellite epoch states. A Bayesian or least squares estimation technique

with an a priori procedure is presented which permits the adjustment of relay satellite epoch state in the reduction of satellite-to-satellite tracking data without the numerical difficulties introduced by an ill-conditioned normal matrix. Author

N78-10989*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SPECTRUM OF HM SAGITTAE: A PLANETARY NEBULA EXCITED BY A WOLF-RAYET STAR
L. W. Brown, W. A. Feibelman, R. W. Hobbs, and C. W. McCracken Oct. 1977 15 p refs Submitted for publication
(NASA-TM-X-71415; X-685-77-253) Avail: NTIS HC A02/MF A01 CSCL 03B

A total of image tube spectrograms of HM Sagittae were obtained. More than 70 emission lines, including several broad emission features, were identified. An analysis of the spectra indicates that HM Sagittae is a planetary nebula excited by a Wolf-Rayet star. The most conspicuous Wolf-Rayet feature is that attributed to a blend of C III at 4650 A and He II at 4686 A. Author

N78-10990# Los Alamos Scientific Lab., N. Mex.
EMISSION CROSS SECTIONS FOR ROTATIONAL TRANSITIONS OF MOLECULES OF ASTROPHYSICAL INTEREST
S. Ames and W. F. Huebner Feb. 1977 130 p refs
(Contract W-7405-eng-36)
(LA-6366) Avail: NTIS HC A07/MF A01

The emission cross sections and Einstein A coefficients of the microwave transitions of numerous molecules of astrophysical interest are presented. ERA

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N78-10991*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ACCELERATION OF PROTONS AT 32 JOVIAN RADII IN THE OUTER MAGNETOSPHERE OF JUPITER
Alois W. Schardt, Frank B. McDonald, and James H. Trainor Sep. 1977 27 p refs
(NASA-TM-X-71410; X-660-77-225) Avail: NTIS HC A03/MF A01 CSCL 03B

During the inbound pass of Pioneer 10, a rapid ten-fold increase of the 0.2 to MeV proton flux was observed at 32 Jovian radii (R sub J). The total event lasted for 30 minutes and was made up of a number of superimposed individual events. At the time, the spacecraft was in the outer magnetosphere about 7 R sub J below the magnetic equator. Before and after the event, the proton flux was characteristic of the low flux level normally encountered between crossings of the magnetic equator. Flux changes at different energies were coherent within 1 minute; a time comparable to the time resolution of the data. The angular distributions were highly anisotropic with protons streaming towards Jupiter. A field-aligned dumbbell distribution was observed initially, and a pancake distribution just before the flux decayed to its pre-event value. The alpha particle flux changed as rapidly as the proton flux but peaked at different times. The energetic electron flux behaved differently; it increased gradually throughout the period. Author

N78-10992*# Hawaii Univ., Honolulu. Inst. for Astronomy.
ASTEROID SURFACE MATERIALS: MINERALOGICAL CHARACTERIZATIONS FROM REFLECTANCE SPECTRA
Michael J. Gaffey and Thomas B. McCord 1977 147 p refs Submitted for publication
(Grant NsG-7310)
(NASA-CR-154510; Publ-151) Avail: NTIS HC A07/MF A01 CSCL 03B

Mineral assemblages analogous to most meteorite types, with the exception of ordinary chondritic assemblages, have been found as surface materials of Main Belt asteroids. C1- and C2-like assemblages (unleached, oxidized meteoritic clay minerals plus opaques such as carbon) dominate the population throughout the Belt, especially in the outer Belt. A smaller population of asteroids exhibit surface materials similar to C3 (CO, CV) meteoritic assemblages (olivine plus opaque, probably carbon) and are also distributed throughout the Belt. The majority of remaining studied asteroids (20) of 65 asteroids exhibit spectral reflectance curves dominated by the presence of metallic nickel-iron in their surface materials. The C2-like materials which dominate the main asteroid belt population appear to be relatively rare on earth-approaching asteroids. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N78-10993 Wisconsin Univ., Madison.
THE THREE-DIMENSIONAL TRANSFER OF SOLAR RADIATION IN CLOUDS Ph.D. Thesis
Roger Davies 1976 232 p
Avail: Univ. Microfilms Order No. 77-8779

Results of a theoretical study of the effects of cloud geometry on the transfer of incident solar radiation are presented. A three dimensional description of cloud geometry was indicated as a prerequisite to the accurate determination of the emerging radiation field. A Monte Carlo and an analytic method were used in modeling. The Monte Carlo model provided accurate values of fluxes and intensities emerging from clouds which were described as a set of connected cuboidal cells, each being homogeneous with respect to extinction coefficient, single scatter albedo and phase function. The analytic model was restricted to clouds made up of a single cuboidal cell and was more accurate for large clouds than small ones. By an iterated approach the analytic model provided both fluxes and intensities of the emerging radiation at any specified point on the cloud's surface.
Dissert. Abstr.

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N78-10994 California Univ., Riverside.
COSMIC AND ATMOSPHERIC GAMMA-RAYS FROM 3 TO 15 MeV Ph.D. Thesis
Rokutaro Koga 1974 253 p
Avail: Univ. Microfilms Order No. 77-14397

Gamma-rays in the energy interval of 3 to 15 MeV at the downward direction of 14 deg to 28 deg to the zenith have been measured from a balloon flight with a telescope. Charged particle interactions were eliminated by an anticoincidence shield of plastic scintillator and neutron interactions were rejected by time of flight during data analysis. Results of calibration with gamma-rays of 1.25 MeV is presented. Energy resolution of 35% and zenith angle resolution of 10 deg were obtained. The upper limits of the fluxes from the Crab Nebula, M87 and the quiet sun were obtained. Pulsed gamma-ray observation from NP0532 was attempted using the period of the pulsation. Arrival time of each gamma-ray event was measured with a time code generator controlled by a WWV signal. The time resolution of the detector encoder was 5 millisec and no statistically significant flux from the pulsar was observed. Dissert. Abstr.

N78-10995*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA RAYS FROM THE MAGELLANIC CLOUDS
F. W. Stecker Aug. 1977 7 p refs Submitted for publication

(NASA-TM-X-71409; X-660-77-216) Avail: NTIS HC A02/MF A01 CSCL 03B

Predicted gamma ray fluxes from the Megallanic Clouds, obtained by using updated parameters, are significantly above the values previously determined, and well within the capabilities of observation from COS-B satellite. Concepts relating galactic gamma ray production and other Population 1 phenomena in the Milky Way were used to postulate a factor of four increase in predicted flux, based on the galactic origin hypothesis. The values obtained provide a possible test of two interpretations of gamma ray emission: enhancement in the inner galaxy from gas and cosmic ray sources alone, or increases produced by the trapping of cosmic rays in spiral arms. Because spiral structure is absent in the small cloud, and questionable in the large cloud, and both clouds are classed as irregular galaxies, the predicted enhancement in gamma ray flux may not be as great in the absence of clear spiral structure. A.R.H.

99 GENERAL

No abstracts in this category.

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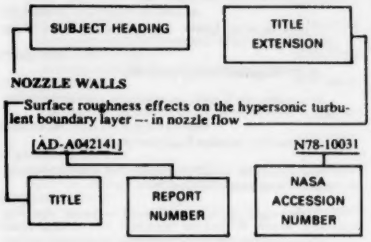

The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

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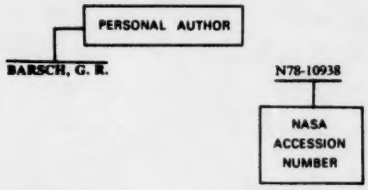

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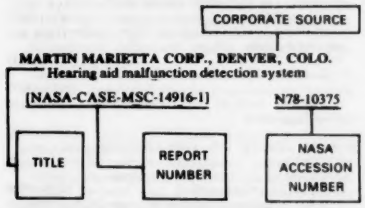

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MCDONNELL-DOUGLAS ASTRONAUTICS CO., ST. LOUIS, MO.
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Aeronautical Engineering: A special bibliography with indexes, supplement 86
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NATIONAL GEODETIC SURVEY, ROCKVILLE, MD.
Application of digital filtering to satellite geodesy
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NATIONAL LIBRARY OF MEDICINE, BETHESDA, MD.
Medical subject headings, tree structures, 1978
[PB-270945/9] N78-10966
Medical subject headings, annotated alphabetic list, 1978
[PB-270894/9] N78-10967
NATIONAL RESEARCH INST. FOR MATHEMATICAL SCIENCES, PRETORIA [SOUTH AFRICA].
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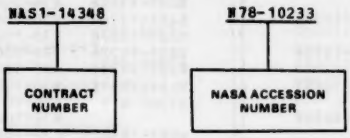

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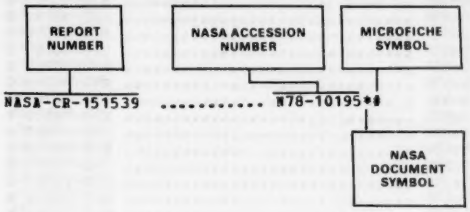

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AD-A044001 ..... N78-10004 #
AD-A044036 ..... N78-10652 #
AD-A044037 ..... N78-10059 #
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AD-A044072 ..... N78-10193 #
AD-A044153 ..... N78-10477 #

AD-A044190 ..... N78-10057 #
AD-A044205 ..... N78-10669 #
AD-A044232 ..... N78-10479 #
AD-A044236 ..... N78-10464 #
AD-A044237 ..... N78-10938 #
AD-A044242 ..... N78-10519 #
AD-A044245 ..... N78-10463 #
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AD-A044268 ..... N78-10425 #
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AD-A044395 ..... N78-10480 #
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AD-A044409 ..... N78-10812 #
AD-A044431 ..... N78-10544 #
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ADL-C-79679 ..... N78-10575 #

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AEDC-TR-77-66 ..... N78-10033 #
AEDC-TR-77-80 ..... N78-10107 #

AERL-RR-432 ..... N78-10448 #

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AFAL-TR-76-35 ..... N78-10382 #
AFAL-TR-76-37 ..... N78-10931 #
AFAL-TR-76-38 ..... N78-10384 #
AFAL-TR-76-190 ..... N78-10124 #
AFAL-TR-77-17 ..... N78-10723 #
AFAL-TR-77-90 ..... N78-10003 #
AFAL-TR-77-158 ..... N78-10366 #

AFAPL-TR-76-87 ..... N78-10560 #
AFAPL-TR-76-89 ..... N78-10476 #
AFAPL-TR-76-103 ..... N78-10421 #
AFAPL-TR-77-9 ..... N78-10563 #
AFAPL-TR-77-12 ..... N78-10565 #
AFAPL-TR-77-13 ..... N78-10451 #
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AFCEC-TR-75-23 ..... N78-10118 #

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AFFDL-TR-76-107-VOL-2 ..... N78-10039 #
AFFDL-TR-77-2-VOL-1 ..... N78-10270 #
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AFFDL-TR-77-29 ..... N78-10220 #
AFFDL-TR-77-33 ..... N78-10948 #
AFFDL-TR-77-61 ..... N78-10424 #

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AFGL-TR-77-0044 ..... N78-10716 #
AFGL-TR-77-0051 ..... N78-10129*#
AFGL-TR-77-0058 ..... N78-10715 #
AFGL-TR-77-0089 ..... N78-10044 #
AFGL-TR-77-0165 ..... N78-10649 #
AFGL-TR-77-0193 ..... N78-10653 #

AFHRL-TR-77-30-ADD-1 ..... N78-10754 #
AFHRL-TR-77-31 ..... N78-10004 #
AFHRL-TR-77-46 ..... N78-10058 #

AFIT-LSSR-30-77A ..... N78-10057 #

AFIT/GCS/MA/77M-1 ..... N78-10778 #

AFLRL-88 ..... N78-10308 #

AFML-TR-76-98 ..... N78-10263 #
AFML-TR-77-23 ..... N78-10050 #
AFML-TR-77-40 ..... N78-10490 #
AFML-TR-77-52 ..... N78-10932 #
AFML-TR-77-55 ..... N78-10268 #

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AFOSR-77-0766TR ..... N78-10930 #
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AFOSR-77-0804TR ..... N78-10820 #
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AFOSR-77-0825TR ..... N78-10787 #
AFOSR-77-0826TR ..... N78-10958 #
AFOSR-77-0828TR ..... N78-10886 #
AFOSR-77-0841TR ..... N78-10298 #
AFOSR-77-0843TR ..... N78-10105 #
AFOSR-77-0872TR ..... N78-10456 #
AFOSR-77-0879TR ..... N78-10807 #
AFOSR-77-0911TR ..... N78-10696 #
AFOSR-77-0945TR ..... N78-10394 #
AFOSR-77-0948TR ..... N78-10763 #
AFOSR-77-0985TR ..... N78-10390 #
AFOSR-77-1011TR ..... N78-10792 #
AFOSR-77-1136TR ..... N78-10761 #
AFOSR-77-1137TR ..... N78-10759 #
AFOSR-77-1138TR ..... N78-10760 #
AFOSR-77-1139TR ..... N78-10758 #
AFOSR-77-1141TR ..... N78-10794 #
AFOSR-77-1142TR ..... N78-10793 #

AFRPL-TR-77-30 ..... N78-10207 #
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AFSG-364 ..... N78-10129*#

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AFWL-TR-76-302 ..... N78-10459 #
AFWL-TR-77-3 ..... N78-10359 #
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AI-TR-403 ..... N78-10766 #

AIAA-PAPER-73-1034 ..... N78-10012*#
AIAA-PAPER-74-160 ..... N78-10014*#
AIAA-PAPER-75-254 ..... N78-10006*#

AMA-77-3 ..... N78-10042*#

AMMRC-CTR-77-19 ..... N78-10272 #

AMMRC-TR-77-11 ..... N78-10513 #

AMRL-TR-76-107 ..... N78-10695 #
AMRL-TR-77-40 ..... N78-10706 #
AMRL-TR-77-58 ..... N78-10707 #

ANL-K-76-3541-1 ..... N78-10585 #

ANL-USBM-1 ..... N78-10247 #

ANL/FPP/TM-77 ..... N78-10894 #
ANL/OEPM-77-2 ..... N78-10584 #

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AR-000-654-PT-1 ..... N78-10305
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ARLCB-TR-77032 ..... N78-10271 #

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ARO-ETF-TR-77-47 ..... N78-10107 #

ARO-VKF-TR-77-35 ..... N78-10033 #

ARO-11783.8-C ..... N78-10851 #
ARO-11944.16-M ..... N78-10779 #
ARO-12120.9-P ..... N78-10458 #
ARO-12121.2-EL ..... N78-10841 #

ARO-12397.1-E ..... N78-10031 #
ARO-12900.6-E-P ..... N78-10350 #
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ASD-TR-76-19 ..... N78-10056 #

ASI-TR-76-37 ..... N78-10705 #

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ASR-77-213 ..... N78-10206*#

ATC-B-94300/6CR-26 ..... N78-10104 #

ATR-73(7256)-2 ..... N78-10246 #
ATR-77(7590)-2 ..... N78-10487*#

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AW-120-6 ..... N78-10525 #

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BC-SEAL-77-02 ..... N78-10715 #

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BM-OFR-114(2)-77 ..... N78-10956 #
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BME-127-77 ..... N78-10456 #

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BNL-NUREG-50601 ..... N78-10278 #
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BNL-TR-637 ..... N78-10589 #

BNL-22275 ..... N78-10244 #
BNL-22676 ..... N78-10614 #

BNWL-2103 ..... N78-10613 #
BNWL-2162 ..... N78-10672 #

BRL-MR-2778 ..... N78-10756 #

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CAA-D-77-2 ..... N78-10800 #

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CED-77-42 ..... N78-10624 #
CED-77-46 ..... N78-10974 #
CED-77-74 ..... N78-10634 #
CED-77-92 ..... N78-10633 #

CEL-CR-77.018 ..... N78-10575 #

CEL-TR-856 ..... N78-10811 #

CEN/DF-77/004A ..... N78-10953 #

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CERL-TECHNICAL-MS-ADS-4 ..... N78-10717 #

CFHR-3-9-72-183-7 ..... N78-10522 #

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COO-4020-3 ..... N78-10891 #
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CRC-APRAC-CAPA-9-71 ..... N78-10619 #

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DNA-2524H-CHANGE-4 ..... N78-10655 #
DNA-4170T ..... N78-10349 #
DNA-4225F ..... N78-10654 #

DOT-TSC-FAA-77-8 ..... N78-10024 #

DOT-TSC-UMTA-77-6-1 ..... N78-10483 #
DOT-TSC-UMTA-77-6-2 ..... N78-10484 #
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D210-11135-3-APP ..... N78-10022*#
D210-11255-1 ..... N78-10046*#

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E-9154 ..... N78-10026*#
E-9155 ..... N78-10097*#
E-9220 ..... N78-10415*#
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ECOM-72-0288-F ..... N78-10568 #
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EMD-77-51 ..... N78-10550 #

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EPA-450/3-77-017-B-VOL-2 ..... N78-10597 #
EPA-450/3-77-017-C-VOL-3 ..... N78-10598 #
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EPA-460/3-76-019 ..... N78-10622 #
EPA-600/1-76-038 ..... N78-10698 #
EPA-600/2-77-054 ..... N78-10978 #
EPA-600/2-77-100 ..... N78-10626 #
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ESD-TR-77-117 ..... N78-10454 #
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